THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME XCI., No. 17. Whole No. 1,794. | NEW YORK, MONDAY, OCTOBER 25, 1909. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. H. WADELTON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

CONTENTS.

An Asterisk (*) Denotes an Illustrated Article.

EDITORIALS—

Anunal Meeting, American Gas Institute—Special Telegraphic Correspondence..... 953

Proceedings, Eighteenth Annual Meeting, Michigan Gas Association—Continued from page 918..... 955

First Day, Noon Session—*Relative Efficiency of Domestic Fuels—Discussion.

Employees' Associations, by Mr. Clare N. Stannard..... 958

*The Photometrical Laboratory of the United Gas Improvement Company, by Mr. C. O. Bond..... 959

*Recent Practice in Coal and Coke Handling in British Gas Works, by Mr. James I. Seager—Concluded from page 914..... 961

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 966

Mr. W. K. Bixby Refuses Presidency of Laclede Gas Co.—Chattanooga (Tenn.) to Make Extensions—Grand Junction (Col.) to Double its Capacity—Champion Range Wins Medal—Natural Gas for St. Louis—Mr. Geo. W. White to Run for the Assembly—Death of Mrs. Alexander Largne—Mr. F. A. Rosch Opens Store in Portland, Ore. —Salem (Mass.) Changes Hands—Boston Edison Statement—A Consolidation in Nassau County—Hearing on Prices in Little Falls, N. Y. —Farmington (N. H.) to Close Down—San Antonio Buys 1,000 Tons of Coal—Weber Gas Engine Company Sold—A Producer Gas Company in Bloomington, Ills.—Election at Evansville, Ind.—New Haven Distributes a Bonus—"Prof." Marks Again Appears—Company Changes in the Far East.

The Market for Gas Securities..... 968

[Special Telegraphic Correspondence.]

DETROIT MEETING, AMERICAN GAS INSTITUTE.

HEADQUARTERS AMERICAN GAS INSTITUTE, PONTCHARTRAIN, DETROIT, MICH., Oct. 20th.

Dear JOURNAL: At the moment, and it is quite a late one, the proceedings of the first day of the fourth annual session of the American Gas Institute have been satisfactorily completed. To begin with, the day opened bright and beautiful, all the glory of a magnificent Indian Summer spell being in the sky and the atmosphere, all bathing this beautiful Michigan city in a haze that, while it dulled, did not darken. From the arrivals in the city yesterday, journeyers trooping in goodly numbers from the incoming of the "Wolverine" flyer, to the last of the regular schedule on all the roads that reach this goodly town, it was early known that the attendance was to be well out of the ordinary; and so it was. For shortly after the appointed hour this morning, well over 300 delegates were comfortably seated in the spacious, thoroughly equipped, beautifully arranged hall—the splendid auditorium of the local hall of the order of Elks—to greet the call to order of the President, Mr. Chas. F. Pritchard. Sedate even to primness, the slight figure of the studious appearing gas craftsman from Lynn, was as straight as that of a yeoman while he summoned the Institute to the work that was before it. Years have come and gone to Mr. Pritchard in many, but time dulls not his wit, nor does labor tire him, for activity and alertness marked his action. At the Secretary's desk was Mr. Albert B. Beadle, of New York, who for the first time appeared with his fellows in active working way. Time, too has dealt fairly with him, although the gray will show in somewhat streaky fashion. However, color matters little where vitality exist, and it surely does with him. The opening measure was sounded by Mr. Irvin Butterworth, who outlined the plan for entertainment, the numbers whereon certainly proved that the Lynn-Butterworth-Williamson, *et al.*, combination had provided profusely and well in respect of the members and their guests. Notably so was this in regard to the fair sex who, according to the programme prepared, had little spare time on their hands, or many gaps in their loose-leaved notation charts. President Pritchard followed with the annual message. We were prepared for something of the useful sort, but even those who expected most were more than repaid for their expectancy. Telegraphing any portion of it, or attempting to give an idea of it in its entirety by means of a paragraph or two would be useless. Trenchant, pointed, clear and cogent, it will stand scrutiny, and will repay close study for that which it contains regarding the art and craft of the American gas makers of to-day. Logical in sequence, filled with matter that appeals directly to those engaged in the industry in any way, the listeners, who remembered some of the arguments put forth in the heated contest for the Presidency during the election for that position two years ago, could not repress the thought that this was the man against whom it was urged by some of his opponents that "Pritchard was not broad enough for the post." Well, if he was not broad enough then, he has spread out considerably since, even to the point of satisfying the most carping of his critics of 1907. However, all's well that ends well; and so it was and is with Mr. Pritchard. Next in line came the report of the Committee on Nominations of Officers. To judge from the Detroit *Free Press* of this morning, the contest for the position of President was to be of the order heroic. In fact its accurate (?) foretelling was to the effect that either or any way in which the contest ended would mean a positive breach in the ranks of the Institute. Well, this is the way it all came out. The Committee on Nominations reported in favor of the election of these:

President—Mr. W. H. Bradley, New York City.
First Vice-President—Mr. R. B. Brown, Milwaukee, Wis.
Second Vice-President—Mr. John C. D. Clark, Chicago.
Secretary and Treasurer—Mr. A. B. Beadle, New York Ctiy.
Members, Board of Trustees—Messrs. D. McDonald, I. C. Copley, J. B. Klumpp, John A. Britton and R. C. Congdon.

A motion was made to accept the report of the committee, the motion carrying with it an instruction that the Secretary be empowered to cast the ballot of the Institute in favor of the election to office of the gentlemen named. The vote was cast as directed, and when the tellers (through Mr. Walter R. Addicks) reported, the cheer that arose fairly shook the meeting room. Order having been restored, and the formal announcement having been made by President Prichard, the grand old Chief arose to acknowledge his promotion. To the writer Mr. William H Bradley has been well and intimately known for well over 30 years, and in all that lengthy period of time he has seen him in many trying conditions. Always a commander, who led his men and made his way rather by counsel than by force, he never looked more a man than he did while standing before the assembly, acknowledging the honor which had been put upon him—yes, thrust upon him. Erect and active, despite his long contest with time, in a voice that rang with the activity of emotion, clear as the notes from a sound bell, and absolutely without a falter, he spoke his appreciation of that which had been done unto him in words, manner and tone that will be long remembered. And a speech, too, it was as well noted for its diction as for its truthful ring. First Vice-President Brown, as active and self-contained as ever, also accepted gracefully his promotion; but the speeches of the others were taken as read. Then followed in rapid sequence an attack upon the regular technical order. This procedure included excellent reports from the "Committee on Public Relations," by Mr. A. P. Lathrop; from the "Technical Committee," by Mr. R. B. Brown; from Prof. Gaus, of the Stevens Institute of Technology, who delivered what was really a finished lecture on "Electrolysis," on behalf of the Electrolysis Committee—the lecture was well illustrated by means of lantern slides, and the lecturer on its conclusion was rewarded by a rising vote of thanks. Other Committees reporting were those in charge of these topics: On "Unit of Light," which was read by Mr. W. H. Gartley, in the unavoidable absence of Dr. A. C. Humphreys; "Benzole Enrichment," by Mr. J. D. Shattuck; "The Utilization of Gas Ap-

OCT 25 1909
SMITHSONIAN DEPOSIT

pliances;" the "Bureau of Information"—Chairman Baehr was roundly cheered for this report and its conclusion, which cheers were well deserved, as our readers will fully attest through the reports which were given in their due order from time to time in the JOURNAL; the International Committee on Pipe Standards—this showed nice harmony in working between the Institute and the Society of Mechanical Engineers. The Report of the Trustees of the Gas Educational Fund showed that the body was keeping well up to its good work of record, and then came a progress report from the Committee on Pipe Standards. The "progress" was owing to the failure of the Chairman (Mr. A. S. Miller) to keep on the task. A couple of invitations were announced, a budget of letters of regret, etc., were noticed, and the morning's proceedings were at an end.

The afternoon session was notable for a considerable accession to the assemblage in the meeting hall. The first set number to engage attention was the paper on "Sliding Scale Regulation of Prices and Dividends," by Mr. Alfred E. Forstall. In the absence of the author the paper was read by Mr. Walton Forstall. Notable in connection with the short discussion thereon was a communication submitted by Mr. Geo. McLean, of Dubuque, Ia., which was in that gentleman's best vein. Then came a most complete paper on "Technical and Mechanical Progress in the Gas Industry," by Mr. Irvin Butterworth. The industry is indebted to that gentleman for many excellent presentations in the past; but in the current one he brings out a symposium that can be read with interest and advantage by everyone connected with the industry. Dr. Edward P. Hyde, of the National Electric Lamp Association, delivered his promised lecture on "Illuminating Engineering." Replete with common sense backed up by the deduction of a well-qualified student in higher fields, the Doctor certainly held his audience right to tension, and his clever deductions were of the order which appealed directly to his auditors. Next came "Illuminating Engineering in its Practical Application," by Mr. Norman Macbeth. This was an eminently practical thesis, and it was nicely amplified by a fine display of lantern slides, and closed the day's proceedings. The fickleness of Autumn was well shown in the weather shift towards nightfall. At dinner time a gentle rain came unbidden, and as I write the storm has gone on to one of force and vigor. However, all are comfortably housed; but those who care to try it about the city have had no trouble in securing "taxies" of any sort, from the famous Packard type, "down or up."

Thursday—The technical proceedings of the sessions were brought to a close at dusk of to-day, the morning and afternoon of which, after the heavy rain and strong blow of last night turned out clear, albeit a little cool, but were it not for the high southwest winds no finer mid-fall day could be calendered. Large as the attendance of yesterday was, that of to-day eclipsed the record of any former meeting of a Gas Association held out of New York city. Quite 600 are in attendance, this number included both members and guests.

To-day for the first time in the history of our American Gas Associations the plan of holding the meeting in two sections, the proceedings to be carried on separately and distinctly, was tried out. This plan has been mooted for some years, but President Prichard was the first to advise that the plan be given a fair trial. It had such trial to-day, and while it more than likely expedited matters in great degree, I am not altogether satisfied that the innovation was a popular one. This morning the papers having a leaning to the engineering side were discussed in Section A, the meeting room being the one occupied yesterday in the regular sessions; the papers of a non-technical tendency were being read in a room on another floor of the Elks Building.

The first thing taken up was the holdover paper of the morning by Mr. A. D. Little, on the "Use of Tar on Roads." It provoked so lengthy a discussion that the Chairman, Mr. W. H. Gartley, was obliged to curtail it, but it certainly was a brisk and varied. The proceedings of Section "A" were then rightly begun with the same chairman. Agreeably to his promise, Mr. C. D. Lamson, of Worcester, Mass., read his paper entitled "A pound of Coal." It, of course, was virtually a record of the construction of and subsequent results obtained in the working of the new Worcester house. To facilitate the progress of the meeting it was determined to read the paper by Mr. Walter G. Africa, of Manchester, N. H., on "Vertical Retorts," as tried out in the Manchester works, in order that a joint discussion might ensue. This did follow, but it seems that separate discussions would have answered better. Certainly the magnitude of the Worcester results would have been better accentuated. However, it was quite general in character although some surprise was shown rather than expressed that such advanced and continued gains in coal carbonization in r tort houses were matters of record. The veteran author whose active experience in gas manufacture and distribution dates back quite two score years, was well applauded. The paper was discussed by Mr. S. J. Fowler and Mr. C. J. R. Humphreys. Mr. E. C. Jones, of San Francisco, now and these many years, but certainly of the East in his earlier days, then gave a well delivered summary of a most interesting paper on the "Development of Oil Gas in California." It was written in excellent vein, his summarizing was perfect and its lines well told how the gas men of the Coast turned oil from enmity into comity so far as the gas business of itself was concerned. A resonant cheer caused the active Coast man to know that his paper and his personality were much welcomed. This closed the morning's session in Section "A." Meanwhile the work of Section "B" had been progressing under the adroit leadership of Vice-President Donald McDonald (Louisville), a studiously inclined audience had cleared the calendar of three interesting papers. These were:

"Gas in the Modern Kitchen," by Mr. Geo. W. Thomson; "The Solicitor," by Mr. Karl A. Schich, and "Commercialism," by Mr. Charles M. Cohn, the competent up to date Secretary of the Baltimore Consolidated Company. Mr. Cohn always has something to say when he writes, and he is to be credited this time with having spoken better than before. He, to a certainty, has the commercial end of trading down to a nicety. These papers were not discussed as they should have been, the speeches partaking often of the order perfunctory. In the afternoon the first order in Section "A" was an excellent paper by Mr. Charles J. Ramsburg, on "Sulphur Compounds in Illuminating Gas," which rather perplexing subject was worked up to a much greater length by him than had been done by any other American author. "Identification of Gas Oils," the conjoint work of Messrs. F. E. Park and L. E. Worthing, was next disposed of, after which the topic of "Power Plants for Gas Works of Medium Size," by Mr. Charles D. Robinson, came in for consideration. This number completed the set paper list for Section "A". The work in Section "B" had been going along conjointly, and as in Section "A" three numbers were on the list. The first was from the ready pen of Mr. T. D. Miller, of New Orleans, who gave to the Institute some further enlightening on "Automatic Oiling Meters," which was of the gentlemans own devising. This revealing was in keeping with a serious promise of a year or so ago. We are not disposed to go into this matter right here and now, but the inventor is certain to have further recourse to the gas men by means of a properly illustrated description and more or less extended record of how this system wears. Mr. Robert O. Luqueer followed with a scholarly series of paragraphs on the "Acceptance and Interpretation of Data," business like, well trained sentences, many of which might be well studied wtth profit by Professor Bemis, Mister Marks, and others whose nerve is the main reason for their being granted retainers to enable them to splurge riduculously as experts in the conduct of the gas business. The sections hereupon came together in joint session once more, and the balance of the routine business such as unfinished business, committee reports, both the regular and supplemental, that took the members near to dusk to finish. Prominent in this was the report of committee on next place of meeting, whose recommendation of Atlantic City, N. J., was indorsed. In this latter connection it was suggested by the committee that the National Commercial Gas Association or a committee therefrom, hold a special meeting in the same place at the like time. With reference to the proposed amalgamation of the Institute and the National Commercial, the joint special committee having charge of the proposition reported in substance that it was not ready to make a final report, and its finding was taken in the nature of a progress communication. The committee also noted that the present sessions of the Institute had proved that joint sessions were easily practicable.

This latter affords a hint that possibly the bodies will remain separate, but each will arrange that their meetings shall be virtually conjoint ones. The other reports were from the Committee on President's Address, on Calorimetry, and a supplemental report from the Board of Directors. Appropriate mention should also be made of the great collection of "Wrinkles" that had been made and carefully arranged under the direction of Editor Cross, who well merited the hearty vote of thanks awarded him, as did the officers, from President Prichard (down and up), for the sustained work that resulted so happily in such a splendid annual reunion. The stag affair, which marked the smoker this Thursday evening, was all to the good. There was enough carded on the *menu*, as to variety and solidity, to cause all of the members who seated themselves around the festive board of the Wayne Casino to know that food and song and merriment could easily coalesce. That everything was as it should be during these hours of ease is best proved by remarking that a flashlight photograph of the merrymakers was taken while the festivities were in full swing. Tokens of the same sort will hereafter adorn many a sideboard and will recall "Jim" Lynn's heroic leading of the band. The vaudeville programme was notable not only for quality but length, not less than 13 separate acts being rendered. However, enough about the stag at this time is sa d if it is said it was enjoyable and enjoyed.

The provision for the entertainment of the ladies of whom at least three score or more are present were many and of decidely pleasing nature. Theater parties, automobile rides in and around the environs of this beautiful city, a visit to the Country Club, which included a well served appetizing luncheon, a run through the famous Grosse Point farms and the like, kept the fair folks on the go, without ever an idle moment. The various committees stood to their guns like the able men they are, and under the royal leadership of Irvin Butterworth, with "Jim" T. Lynn, J. G. Hoffman, V. F. Dewey, H. L. Olds and E. F, Lloyd, as efficient aides, no other verdict save that of complete success may be awarded. The weather conditions to-night as presaging those that may obtain to-morrow during our looked-for boat ride on the good ship "Wauketa" are favorable. So we wait the call to assemble for sharp 10 A.M. for our trip along beautiful Belle Isle, the promised glimpse of Lake St. Clair and the subsequent inspection of that great piece of engineering work going on in connection with the Livingston channel and the terminating visit of inspection to the mammoth plant of the Semet-Solvay Co. But of this another story must be told, in that the copy for present accounting will be in the printer's hands for the JOURNAL's next ere this trip is half done. So ends the fourth annual meeting of the American Gas Institute, every chapter of which (and many chapters there are) holds much that is satisfactory, more that is pleasant and most that is convincing of another year's work in its history that counts for a year's work worthily done.—T. J. C.

[CONTINUED FROM PAGE 918.

PROCEEDINGS, EIGHTEENTH ANNUAL MEETING, MICHIGAN GAS ASSOCIATION.

HELD ON BOARD STEAMER "ST. IGNACE," FROM DETROIT EN ROUTE TO MACKINAC ISLAND.

FIRST DAY—NOON SESSION.

The President introduced Mr. John H. Wyman, of Ann Arbor, Mich., who read the following paper on the

RELATIVE EFFICIENCY OF DOMESTIC FUELS.

Introduction.—During the months of June and July a number of tests were made at the Ann Arbor Gas Company's plant on domestic fuels, for the purpose of ascertaining the relative value of fuels as used in house heating boilers. For this purpose a hard coal, round, water boiler was used, for the reason that more hard coal boilers are installed in the houses than those of the soft coal or coke type. A water boiler was used because of the simplicity of set-up and operation and because of the facility with which it could be used as a calorimeter.

Fuels Tested.—The fuels tested were those commonly used for house heating purposes. A number of experiments were first made on coke until consistent results were obtained. These were followed by tests on Pittsburgh coke, anthracite coal and Pocahontas coal. Two sizes of gas coke (egg and nut) were tested separately. By nut size coke, we mean all that passes through a 1-inch screen and goes over a ½-inch screen. All coke passing over a 1-inch screen we call egg. The coals were tested as supplied from the dealers and the gas coke as taken directly from the storage bins.

Description of Boiler.—The boiler is built of 5 cast iron sections—the base and grate section, the firepot, two intermediate sections and the drum section. The water surrounds the firepot and extends up through nipples into the intermediate and drum sections.

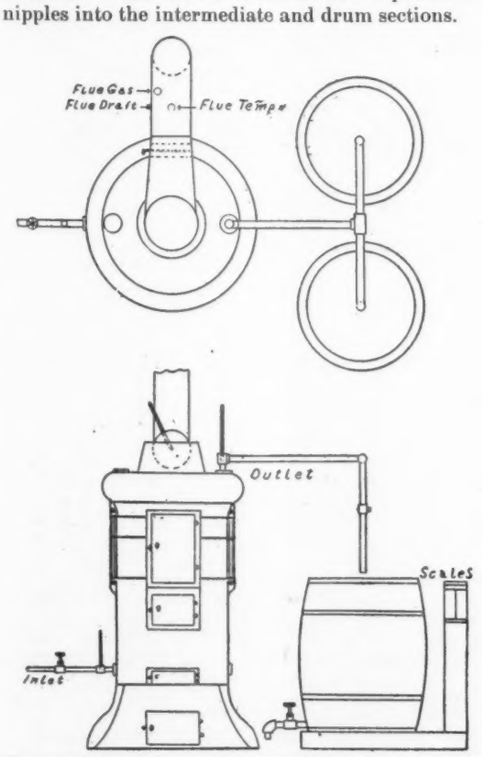


Fig. 1.—Plan and Elevation Showing Hot Water House-Heating Boiler Used in Tests

The dimensions of the boiler are as follows:

Rated capacity radiating surface	1,150 sq. feet.
Height over all	68½ inches.
Height to overflow	60 "
Height to center of inlet	17½ "
Height from grate to center of firing door	16 "
Firing door	9 by 13½ "
Kind of grate	plain rocking.
Width of grate	24 inches.
Length of grate	24 "
Area of grate surface	3.14 sq. feet.

Arrangement of Apparatus and Method of Conducting Tests.—Water under city pressure enters the boiler at the bottom, after passing through a valve with which the flow of water is regulated. At the outlet the water passes through a 1¼-inch pipe into weighed barrels situated on scales near the boiler. The outlet pipe is arranged so that the water can be run alternately into barrels and as one of these is being filled the other may be weighed and emptied. Thermometers are placed at the water inlet and outlet of the boiler and also one in the stack. The tests were conducted in the following manner:

A fire was first started and the temperature of the outlet water was brought as near as possible to 100° above the inlet temperature. The fire was then withdrawn and a weighed amount of kindling placed in the boiler and lighted, at which time the water was switched into a weighed barrel and readings commenced. The weighed fuel was then fired till the boiler was full and no more attention was paid to it till the end of the test. The draft in the ashpit door was opened about ¼ inch and the damper in the stack was left nearly closed. A difference of temperature of 100° was maintained as near as possible, between the inlet and outlet water by regulating the rate of flow.

Readings were taken every 5 minutes of inlet, outlet and stack temperature, chimney draft and fire temperature. The fire temperature was taken by means of an optical pyrometer. The weight of water was taken for each hour and B.T.U.'s computed for intervals of 1 hour. Flue gas analyses were also made each hour.

Six-hour tests were made on coke and 8-hour tests on anthracite and Pocahontas coals. At the end of the test the fire was dropped and spread evenly on the floor, where it quickly cooled off. All unburned fuel was separated from the ashes and weighed. The slate and ash were weighed separately. A record of the test was kept in periods of 1 hour, as the quantity of heat transferred from coal to water will vary from hour to hour, being the combustion of the fuel more or less active. The hour which shows the greatest heat transfer is taken as the maximum capacity.

Calculation.—To determine the number of B.T.U.'s given off by the fuel, we multiply the rise in temperature of the water passing through the boiler by the weight of water during that period. The B.T.U's were determined for each hour separately and the sum taken for the total. The total number of B.T.U.'s, divided by the weight of coal burned, will give the B.T.U.'s per pound of coal, and this, divided by the number of B.T.U.'s in the coal, gives the efficiency of the boiler. The heating value of the different fuels were taken from results obtained by the U. S. Geological Survey during some of their tests.

Boiler Rating.—The following method of rating hot water boiler was obtained from the American Radiator Company:

1. That 1 square foot of piping, mains and risers shall be equivalent to 1 square foot of radiation, and shall be so counted when computing the boiler load.
2. That the air surrounding the boiler shall be 70° F.
3. That the temperature of the water leaving the boiler shall not exceed 180° F., at which temperature the radiation shall be sufficient to keep the room at 70° F. in the coldest weather.
4. That when the water leaves the boiler at 180° F. the temperature of the return water shall be 160° and the mean temperature of the radiator 170° F.
5. That under the above conditions 1 square foot of radiation will emit 177 B.T.U.'s per hour.
6. The capacity is determined by dividing the heat available per hour by 177.

Table No. 1.—Table No. 1 gives full results of tests, and from this table other results are computed.

Table No. 2.—Table No. 2 was obtained by averaging the results from Table No. 1.

The fuels are arranged in the order of their efficiency. First, we have Pocahontas, the least efficient; second, anthracite; third, Pittsburgh coke; fourth, egg size gas coke; fifth, nut size gas coke. This table shows that while the efficiency of coke is greater than hard coal or soft coal, the boiler capacity is less. This is easily explained when we consider that coke weighs only ½ as much as hard coal.

By installing a boiler with a larger firebox than for hard coal, the capacity can be increased to that of hard coal. Such boilers are made under the name of coke boilers. For the three kinds of coke tested, Pittsburgh, gas coke (egg size) and gas coke (nut size), the nut size gas coke gives the greater efficiency and also the larger capacity. All of these cokes were run under the same condition of draft and flue temperature. By running a test on coke under heavy draft a capacity above the rated capacity was developed.

TABLE I.—*Tests of Hot Water Boiler for House Heating, Designed for Anthracite.*

	Soft Coal.		Hard Coal.			Pittsburgh Coke.		
Boiler.								
1. No. and description, 3-25-W Arco	No. 1.	No. 2.	No. 1.	No. 2.	No. 3.	No. 1.	No. 2.	No. 3.
2. Grate dimensions 24 inches by 24 inches	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14
5. Water capacity, gallons	32	32	....	....	....	....	....	....
6. Average temperatue of boiler room	75°	75°	80°	78°	78°	85°	....	....
7. Fuel capacity, pounds	156	156	195	195	195	109	109	109
8. Fuel average available	125	125	156	156	156	93	93	93
Fuel.								
9. Start fire	....	....	....	....	....	....	....	....
10. Duration of test, hours	8	5	8	8	8	6	6	6
11. Kind of fuel	Pocahontas	Pocahontas	Anthracite	Anthracite	Anthracite	Coke	Coke	Coke
12. Total fuel, pounds	143	70	185	175	175	79	75	79
13. Total ash, pounds	7	5	12.5	13	15	8	6.5	6.5
14. Total slate, pounds	....	....	....	....	....	2	1.5	2
15. Total unburned fuel, pounds	35	17	82	72	65	24	22	24
16. Net fuel consumed, pounds	108	53	103	103	110	55	53	55
17. Fuel per hour (item 16 ÷ item 10)	13.5	10.3	12.9	12.9	13.7	9.17	8.8	9.1
18. Fuel per hr. per sq. ft. grate surface (item 17 ÷ 2)	4.3	....	4.1	4.1	4.35	2.88	2.8	2.9
19. Average temperature air entering fire	75°	75°	80°	78°	....	....	....	....
20. Average temperature escaping gases	400	309	310	320	330	275	285	280
21. Chimney draft, inches of water	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
22. Frequency of firing	1	2	1	1	1	1	1	1
Heat Transfers in B.T.U.								
24. Heat transfer from coal to water	1,035.698	525,923	864,883	892,762	922,529	452,123	471,348	439,329
25. Calorific power per pound fuel (item 24 ÷ 16)	9,589	9,923	8,396.9	8,648.1	8,386.6	8,220.4	8,893.3	8,969.6
26. Heat available (item 8 × 25)	1,198,625	1,240,375	1,309,776	1,349,103	1,308,306	765,497.2	827,076.9	834,172.8
27. Heat available per hr. for 8 hrs. (item 26 ÷ 8)	149,828	155,047	163,722	168,368	163,578	95,687.1	103,384.6	104,271.6
28. Heat available per hour of test (item 24 ÷ 10)	119,462	105,184	108,110	111,600	115,316	175,354	178,558	182,221
29. Maximum heat transfer, 1 hour	162,474	136,572	120,935	141,905	132,046	100,770	98,917	104,284
Boiler Capacity.								
31. Boiler capacity (8 hrs., 180° outlet) (item 27÷177)	846.5	876	925	952.7	923.9	523.6	584.1	580
32. Capacity developed per hr. of test (item 28 ÷ 177)	730	595	610	630	650	426	444	465
33. Maximum capacity, during 1 hr. (item 29 ÷ 177)	920.7	773	680	801.7	746	570	558	580
35. Calorific power of fuel	14,750	14,750	12,679	12,679	12,679	12,183	12,183	12,183
36. Efficiency of boiler, pr. ct. fuel rate (item 25÷35)	65	67.2	64.6	68.2	66.1	67.5	73	73.7
37. Per cent. ash and slate	6.5	9.5	12.1	12.6	13.6	18.2	15.1	15.4
38. Carbon dioxide, per cent	10.5	10.3	12.8	13.5	....	....	....	....
39. Carbon monoxide, per cent	1.1	1.8	1.3	1.1	1	....	....	....

Hot Water Boiler for House Heating, Designed for Anthracite.

	Gas Coke, Egg Size,			Gas Coke, Nut Size.			
Boiler.							
1. Number and description, 3-25-W Arco water boiler	No. 1.	No. 2.	No. 3.	No. 1.	No. 2.	No. 3.	No. 4.
2. Grate dimensions, 24-inch by 24-inch	3.14	3.14	3.14	3.14	3.14	3.14	3.14
5. Water capacity, gallons	32	32	32	32	32	32	32
6. Average temperature of boiler room	84°	78°	78°	80°	78°	73°	75°
7. Fuel capacity, pounds	109	109	109	109	109	109	109
8. Fuel average available	93	93	93	93	93	93	93
Fuel.							
9. Start fire	....	....	....	.....	.....	.....	....
10. Duration of test, hours	8	6	6	6	6	6	3
11. Kind of fuel	Coke.	Coke.	Coke.	Coke.	Coke.	Coke.	Coke.
12. Total fuel, pounds	82	89	76	83	78	79	85
13. Total ash, pounds	6	7	5	7	6	5	5.5
14. Total slate, pounds	....	.5	....	1	1	1	..
15. Total unburned fuel, pounds	25	30	22	24	19	15	12
16. Net fuel consumed	57	58	54	59	59	64	73
17. Fuel per hour (item 16 ÷ item 10)	9.5	9.7	9	9.8	9 8	10 7	24.3
18. Fuel per hour per sq. ft. grate surface (item 17 ÷ 2)	3.02	3.09	2.65	3.12	3 13	3 4	7.75
19. Average temperature of air entering fire	84°	78°	78°	80°	78°	73°	75°
20. Average temperature escaping gases	....	....	....	.....	.....	.....	....
21. Chimney dratt, inches of water	.01	.01	.01	.01	.01	.01	.01
22. Frequency of firing	1	1	1	1	1	1	1
Heat Transfers in B.T.U.							
24. Heat transfer from coal to water	520,749	532,112	501,300	570,916	563,936	608,317	666,181
25. Calorific power available per pound fuel (item 24 ÷ 16)	9,135.9	9,174.3	9,238.3	9,693 4	9,558.6	9,504.95	9,125.7
26. Heat available (item 8 by 25)	849,638.7	853,209.9	859,161.9	901,486.2	888,949.8	883,965	848,690 1
27. Heat available per hour for 8 hours (items 26 ÷ 8)	106,204.8	106,651.2	107,305.2	112,685.8	111,118.7	110,500	106,086
28. Heat available per hour of test (item 24 ÷ 10)	85,125	88,700	83,550	95,152.6	94,000	101,400	222,000
29. Maximum heat transfer in 1 hour	103,881	119,215	111,248	118,000	112,714	123,578	287,359
Boiler Capacity.							
31. Boiler capacity (8 hours, 180° outlet) (item 27 ÷ 177)	601	602	604	636	625	622	600
32. Capacity developed per hour of test (item 28 ÷ 177)	481	501	473	538	530	570	1,250
33. Maximum capacity during 1 hour (item 29 ÷ 177)	586	673	630	667	637	695	1,640
35. Calorific power of fuel	12,183	12,183	12,183	12,183	12,183	12,183	12,183
36. Efficiency of boiler in p. c. of fuel rate (item 25 ÷ 35)	75	75.4	75.9	79.5	78.5	78.1	75.1
37. Per cent. of ash and slate	10.5	12.9	9.26	13.5	11.7	9.50	7.3
38. Carbon dioxide, per cent	....	....	....	.....	.....	14.4	....
39. Carbon monoxide, per cent	....	....	....	.....	.....	1.2	....

TABLE II.—*Averages from Table I.*

Kind of Fuel.	Total B.T.U.'s Assumed per Pound.	B.T.U.'s Obtained per Pound.	Efficiency in per cent.	Cap. per Hour for 8 Hours Square Feet Heating Surface.	Cap. per Hour of test for 1 Hour. Square Feet.	Per Cent. of Cap. per Hour for 8 Hours.	Per Cent. of Cap. per Hour of Test.	Ash Per Cent.
Pocahontas.....	14,720	9,576.0	66.10	861.2	663.0	75.0	57.5	8 0
Anthracite	12,679	8,477.2	66.30	931.3	645.0	81.0	56.0	12 8
Pittsburgh coke..	12,183	8,694.4	71.40	925.7	445 0	54.5	38.7	16 2
Gas coke (egg size)....	12,183	9,182.8	75.43	602.0	485.0	52.3	42.2	10 9
Gas coke (nut size)	12.183	9,585.6	78.7	627.7	546.9	54.6	47.5	11 6
Nut size (heavy draft).	12,183	9,125.7	75.0	600.0	1,250.0	52.2	108 5	7 5

The price of fuels given in Table III. was the market price at time of making tests. The table shows that the cost of raising 1,000 pounds of water 100° F. is the greatest with anthracite coal and least with nut size gas coke.

TABLE III.—*Economical Results.*

Kind of Fuel.	Cost of Fuel Per Ton.	Cost of Raising 1,000 Pounds Water 100° F.	Cost in Per Cent. Anth. = 100.	Cost in Proportion to Heating Value.
Pocahontas.....	$6.00	3.07c.	73.4	$4.40
Anthracite.....	7.10	4.19c.	100.00	7.10
Pittsburgh.....	5.00	2.87c.	68.5	3.40
Gas coke (egg size) ...	5.00	2.72c.	65.0	3.25
Gas coke (nut size)....	5.00	2.61c.	62.3	3.12

By paying $7.10 for anthracite coal an equivalent amount of heat can be obtained from $3.12 worth of nut size gas coke, at $5 per ton.

From Table IV. we may infer that as the efficiencey of the fuel increases the per cent. of carbon dioxide increases with decrease of carbon monoxide.

TABLE IV.—*Relation of Flue Gases to Efficiency.*

Kind of Coal.	Efficiency.	CO_2.	CO.
Pocahontas....	66.10	10.4	1.4
Anthracite.....	66.30	13.1	1.2
Gas coke.....	77.1	14.4	1.2

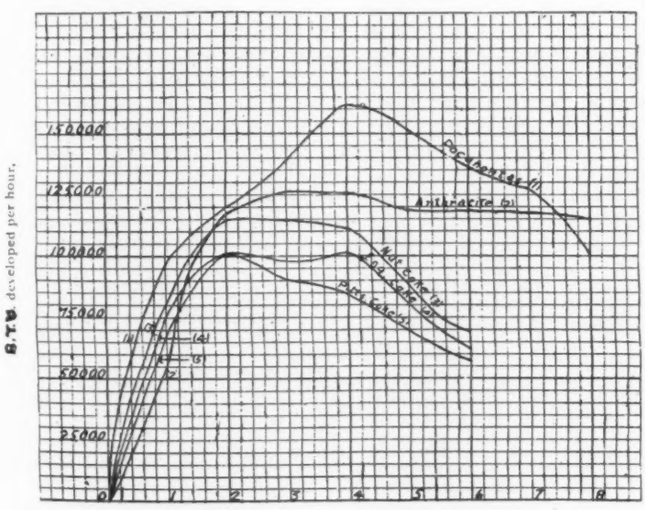


Fig. 2.—Rate of Combustion in B.T.U.'s Per Hour.

The rapidity with which a fire may be kindled and brought up to a good heat is essential in house heating fuels. From the above curves it will be seen that Pocahontas coal is the easiest kindled of the different fuels tested. Next comes nut gas coke; third, egg gas coke; fourth, Pittsburgh coke, and lastly anthracite coal. It will also be noted from the curves that the heating value of coke remains practically constant during the first 4 hours and then gradually decreases to the end of the test. Pocahontas coal reaches its maximum at the end of the fourth hour, after which it begins to decrease. Anthracite coal reaches its maximum at the third hour and practically holds that value throughout the rest of the test.

Conclusion.—From the data obtained and from the manner in which the different fuels burn, it is evident that the gas coke has a decided advantage over other domestic fuels. It is easily kindled, burns with an even, smokeless fire and is easily controlled and clean to handle. It is the most economical fuel on the market and there is no reason why in time it should not take its place at the head of all of the forms of domestic fuel.

Discussion.

The President—You have heard Mr. Wyman's paper. It is now before you for discussion.

Mr. Douglas—I wish to call attention to one or two things noted in the paper. First, that no preference was given coke in this test. The anthracite boiler used was assigned for that purpose and had a heating capacity for anthracite coal. It is remarkable, therefore, that this heating capacity held up as well as it did in the case of coke. We had practically a constant fire for 4 hours, and we undertook the tests practically in order to have some absolute data to present to our customers. People frequently came to the office and asked, "Does a ton of coke compare favorably with a ton of coal." The answer from our experience was that it was just as good, but now we can tell them we know a ton of coke is twice as good as a ton of coal. The outcome in every case will duplicate the results. Every test was run twice and we did not use any tests until we could duplicate them. We know now just what our coke is worth, and that as you can buy just as much heat for $3.12 in coke as for $7.10 in coal there is no reason why the price of the former cannot be brought up to the price of anthracite coal. I look to see this accomplished.

Mr. Dewey—I have not had an opportunity to read this paper thoroughly. I did look over Table 4 and Fig. 3. The increased efficiency on account of gas coke is explainable by the increased CO_2, showing a very marked increase in the available amount of heat used in warming the water. I was somewhat suprised to note that nut coke gave better results than ordinary egg coke. That probably can be explained in like way, or that, on account of less void in the furnace, there was less chance for air holes with consequently a higher percentage of CO_2.

Mr. Butterworth—I had not read this paper, and wondered whether, as a matter of fact, the boiler used was adapted to anthracite coal. It is said it was made for anthracite coal, but it is a question whether or not it was adapted to it. As a matter of fact it was not as well adapted to anthracite coal as to coke, as the test showed. One thing in connection with the paper, and some of the comments thereon, I wish to mention is that we talk about the easy kindling of gas coke. We give the public the impression that a coke fire is one that will go out and need kindling every morning. What we really mean is that it is easy to bring a small fire up to a big fire. We should say that a coke fire need not be kindled any more than coal, if it is properly handled. Always put it just that way so you wont be misunderstood.

Mr. Douglas—The boiler was obtained from the American Radiator Company. It is considered one of the best boilers. While it is presumed to be adapted to burning coal, it evidently is not so adapted, or we would have secured better results. In any event it represents the average type, or better, of house heating apparatus. We tried to make these tests under conditions identical with those under which a householder would operate.

Mr. Schaddellee—I understand that all these tests were made with the same drafts. I question whether it is fair to test anthracite coal under the same draft as coke.

Mr. Tippy—On looking at Table No. III. I cannot understand it. Look at column No. 3, then at column No. 5. No. 3 shows the cost of raising 1,000 pounds 100° F. with anthracite coal was $4.19, and with gas coke $2.61. The anthracite does not cost double. In the last column, in relation to the heating value, anthracite costs $7.10 and gas coke $3.12, or more than double. It seems to me these costs should bear the same relative proportion. Do I infer from that that a given amount of heat would cost twice as much if obtained from anthracite coal than if obtained from coke.

Mr. Wyman—Yes.

Mr. Tippy—Then we should get at least $10 a ton for our coke, instead of $5, if we sold them on the same dollar-and-cent basis. It certainly seems we are not getting what we should for our coke. I also think this is an intensely interesting paper, for if these figures hold out we have some big arguments that have never been used in our coke "ads."

Mr. Seymour—This paper shows the necessity of educating the public to the proper way of using coke. If it were properly used we should get greater efficiency out of it than from hard coal. The trouble is most people do not use coke properly. Getting too much draft they get too hot a fire, losing much of the heat value in fuel gases by shutting down. I think, with all our good arguments, we should educate the people to the proper use of this fuel.

Mr. Blauvelt—A number of matters in this report I think are not sufficiently clear, and some data appear to be incorrect. In Table No. II. the author gives equal heating values for Pittsburgh coke, gas coke (egg size), gas coke (nut size) and nut size heavy draft, all being 12,183 B.T.U. In the last column of that same table Pittsburgh coke was given as 16 3/16 per cent. ash, gas coke, egg size, was 10 1/16 per cent. ash, and gas coke, nut size, was 11 6/16 per cent. ash. It is obvious that with the varying percentages of ash the B.T.U.'s per cent. of the various cokes tested could not have been the same. As I understand it these efficiencies given are obtained by dividing the number of B.T.U.'s absorbed by the water by the heat units carried by the fuel. If that is the case you will get the wrong answer if you don't start right, and it is obvious that these different cokes cannot all have the same heating value. This error tends to lessen the value of the paper. I would like to ask if there was any allowance for moisture carried by the various cokes used.

Mr. Wyman—There was no moisture determined.

Mr. Blauvelt—The percentage of moisture varies quite a good deal, and additional value would have been given the report if that had been determined. Regarding the conclusions reached, while these are rather more favorable to coke than we would have expected, yet we should have expected to get a higher heating value in a house heating appliance from coke than from anthracite, as was obtained in carefully conducted tests that were made at the University of Illinois, under the supervision of the U. S. Geological Survey. Many of you have possibly seen the pamphlet describing these tests. I was much surprised that more use was not made of it in our business, because tests were made there with coke, anthracite coal and the various soft coals to determine the actual comparative value of the different fuels used in house heating appliances in that section of the country. In that test they figured all the fuels back to a common price basis, as though they cost the same per ton and gave the relative heating values if they cost the same per ton. The results showed that of all house heating fuels you can afford to pay a slightly higher price for Pocahontas coal than for any other fuel, which is due, of course, to its high heating power. The next highest was coke, anthracite coal third, or if at a certain place Pocahontas coal costs $5 per ton, and anthracite is actually worth $4.56, coke, $4.64, and Pennsylvania coal, $4 80; if anthracite sells at this same place at $8, it is a luxury by $3.44 over Pocahontas. At another place, should anthracite cost $8.20 per ton, the Pocahontas coal would be worth $9 a ton, good Pennsylvania coal, $8.65, coke, $8.35, and good Illinois coal, $5.33. The tests were made in a similar boiler to the one used by Dr. Wyman.

Mr. Ewing—In connection with Mr. Blauvelt's statement, as I remember it, anthracite coal was quoted as a luxury by $2.44 a ton. In other words you could afford to pay $2.44 per ton more for coke than you could for hard coal to get exactly the same heat efficiency. That pamphlet is one that can be had by writing the U. S. Geological Survey, and it gives tests on carbon that were very complete along this line.

Mr. Wyman—As to Mr. Blauvelt's remarks touching upon the fact that the same number of B.T.U.'s are stated in my report to be contained in the different kinds of coke mentioned, I will say we did not have the apparatus necessary to make an accurate analysis. The boiler used in our tests was named as a hard coal boiler in the catalogue of the American Radiator Company. Their coke boiler has a considerably larger firebox and the capacity for coke would be much higher if we had a coke boiler.

Mr. Douglas—I think I can explain Mr. Blauvelt's criticisms as to the different amounts of ash contained in the coke where they had the same theoretical heating values. The coke was not burned to a complete ash in any case. The fire was drawn after the capacity began to go down and the coke picked out from the ash. Every piece of coke would have, of course, some ash from it, which would explain the difference. We had no apparatus for carefully and scientifically determining, and we went through the different tests, running them as they would be run in a house, so as to get results that anybody could obtain.

Mr. Schaddelee—In the case of anthracite. In the same furnace they combusted 185 pounds of anthracite in 8 hours, and as low as 75 pounds of coke in 6 hours, so that the rate of combustion was much more rapid in coal than in coke, which is also shown by the higher heat of the two gases.

On motion of Mr. Frazer a vote of thanks was passed to Mr. Wyman for his most interesting and valuable paper.

(To be Continued.)

Employees' Associations.[1]

[By Mr. Clare N. Stannard, Sec. Denver Gas and Electric Co.]

One of the first steps taken by Henry L. Doherty and Company, upon the acquiring of a property, is the organizing of one or more employees' associations. This has repeatedly proven a wise and profitable measure, for invariably it materially promotes the employees' and company's interests. A small company usually maintains one employees' association and incorporates in that organization several important objects. A large company can maintain a number of different organizations. Briefly mentioned, the important points covered by the work might be incorporated in the following: First, social association; second, mutual aid association; third, educational association.

As before mentioned, a small company might form an association covering the three subjects, while a large company should have three separate organizations to individually promote each of the subjects mentioned. We believe the association should be officered and managed by the employees of the company, consisting of chairman, vice chairman, secretary and treasurer, the officers holding their positions for one month's time; thus enabling various ones to have the beneficial experience occasioned by being officers of the association.

First: Social Association.—Under this heading we believe it is wise for the employees to frequently meet in a social way and become acquainted. It has been found profitable for the employees to give parties, social dances, etc. Relaxation from continuous business cares results in employees becoming acquainted with one another, and more willing to co operate. This co-operation also extends to more friendly relation between the departments of the company.

The establishment of baseball teams and bowling leagues, and by the young ladies a basket ball team, has a tendency to promote sociability, not only between the employees, but by the opposing teams whom they may meet. It also provides inexpensive and excellent advertising for the company supporting the teams.

Second: Mutual Aid Association.—Its object is best expressed by stating Article 2 of a well-known gas company's mutual aid association, which reads: "The object of this association shall be to provide assistance to members in case of illness, disability or death." The members of this association pay a small monthly assessment, as per the following: Those receiving $50 per month or less, 30 cents; over $50 and not more than $75, 50 cents; over $75 per month, 80 cents. The gas company donates to the mutual aid association a sum equal to 25 per cent. of the monthly collections paid in to the association by the employees.

From the dues thus collected the employees receive the following benefits: The association pays their doctor bills, prescriptions, nurse and hospital bills; such bills, however, are limited to a total sum of $110; and, in case of death, an additional benefit of $100 is paid. In addition a calling committee is appointed, whose duty it is to call upon the sick, sending them flowers and rendering all aid and assistance possible.

The association is the means of doing a vast amount of excellent work, which is greatly appreciated by the members benefited. It promotes thrift and the proper independence of the employees.

In addition to the officers above mentioned we believe this organization should be governed by a board of directors, who should meet monthly and pass upon all bills and applications for aid.

Third: Educational Association.—At one time gas companies paid little attention to the education of its employees; this condition has changed, and at the present time great stress is rightfully laid on the subject of education.

Some name similar to the following might be given the organization; namely, Commercial Council. The council formed should have permanent officers; the meetings should be presided over by the chairman, and conducted along the lines of parliamentary law. Educational matters should be taken up and discussed, papers of interest presented, and debates on important subjects. It is profitable to take up matters in connection with the gas business, aside from those of a purely commercial nature. For instance, we should advise through the council the study of the manufacture and distribution of gas, bookkeeping, office methods and accounting.

In addition to the features just mentioned, it might be well to incorporate in the work some or all features found in the scientific study of salesmanship, a course of illuminating engineering, and a

1. October "Bulletin," Nat. Com. Gas Association.

thorough study of all principles involved in supply of gas for fuel, light and power.

This organization will, first, develop the representative; second, create system and organization; third, promote intelligent discussion; fourth, create and maintain enthusiasm and efficient salesmanship.

1. Developing the representatives by their attending and taking part at all meetings, which makes it easier for them to talk in public. Through the men knowing that they are expected to take part, they come prepared to do so, which necessitates their talking intelligently upon all subjects and matters discussed. Attendance at meetings, thus learning what others are doing, stimulates favorable competition.

2. Creates system and organization. In order to attain the highest degree of efficiency and success in any line of business it must be managed along the lines of perfect organization. If the men are managed at the meetings by intelligent direction, they soon discover a perfect system and organization are being maintained. They understand that orders given are not meaningless, but that they must be obeyed, and when we once obtain and maintain this class of system, organization and discipline, we have done much to make our work successful.

3. Promotes intelligent discussion at the meetings. By men taking part who possess original ideas, they are afforded an opportunity of mentioning them, and in this way the company discovers the men who do not possess ability or originality; and, most important, we learn who are our real thinkers. New plans are continually being proposed by the new men, which are in turn discussed by the management, and those thought to be good acted upon. These discussions promote mutual encouragement and assistance.

4. Creates and maintains enthusiasm and efficient salesmanship.

The holding of frequent meetings and the enthusiasm and interest created by the discussion invariably cause the men to leave the meeting with a great desire to immediately close some good contract. Take, for instance, the new man desirous of immediately showing us that he also possesses a degree of salesmanship equal to that of some representative who has just told of having secured a large contract.

We believe in having frequent talks, calculated to inspire the men with enthusiasm, and giving them talks on what enthusiasm means. Again, take up the subject of personal magnetism and treat it in the same manner as enthusiasm.

Salesmanship should be frequently discussed and the men be shown what qualities they should possess to become successful sales men. These talks are all for the purpose of creating a desire to excell in the possession of enthusiasm, magnetism and salesmanship.

Associations established along the above described lines give us a perfect organization, system and discipline, lessens our costs and greatly increases our efficiency.

The Photometrical Laboratory of the United Gas Improvement Company.

[Abstract of a paper read by MR. C. O. BOND at the Third Annual Convention, Illuminating Engineering Society.]

It is only within the past 10 years that much interest has been aroused as to the efficiency of the different sources of light. Whether the light was intended for interior illumination or for street or decorative illumination, the people have been satisfied with such illuminants as have been furnished them, provided they were not too expensive; but, with the age of invention in electric and gas and oil sources of light, and their distribution, there has come upon the market a great variety of lamps suited for various purposes, and the most extravagant claims have been made for some of these. Of course, this resulted in strong competition, and it became necessary to establish suitable referees who would be able to decide whether or not these claims were truthful. Out of this need for referees grew the photometrical laboratories, of which several excellent ones now exist in this country. It would be difficult, however, for any one laboratory to successfully undertake the photometering of lamps having, as their sources of energy, all the different illuminants before mentioned. Particularly would this be difficult in the case of gas, the different kinds of which are not readily transportable in sufficient quantity to meet the purpose of testing.

This laboratory (that of the United Gas Improvement Company) is situated in a 2-story and basement building, about 26 by 100 feet, within the Point Breeze gas works, in the city of Philadelphia. One of the objections to placing a laboratory within the confines of the gas works was that the atmosphere would at times undoubtedly be smoke-laden, and to overcome this objection the doors and windows of the laboratory are all made double sashed and as tight as possible. The air entering the building will be thoroughly filtered, and by means of a ventilating fan put under such pressure that all tendency to leakage will be outward and not inward, thus avoiding, as far as possible, the accumulation of dust and obviating the smoke nuisance By having such a control, also, of the air entering the building, it will be possible on very humid days to considerably reduce the humidity as the air enters.

One of the basement rooms was plastered throughout, provided with double doors between it and the other basement, and given an ample ventilating stack. In this room has been placed the first installment of a storage battery meeting all present requirements. This battery is composed of 74 cells arranged in 4 sections of 13 cells each and 22 end cells, giving a total voltage of about 150 volts. The battery is charged from a direct current generator situated within the works. This battery is so wired that any voltage may be obtained from 2 to its total capacity, and a distributing switchboard has been devised which enables current to be delivered to any of the 12 terminals in the building.

The basement room, in the other end of the building, is the inlet room for coal gas, water gas and mixed gas, compressed air, water and steam. The mixed gas is delivered through a 2½-inch pipe, and passes through what is known as a "60-A" meter, capable of passing 1,800 cubic feet of gas per hour. This mixed gas is led from a 3,000,000 foot holder nearby. The meter has 2 outlets; one to a life-test room through a governor adjusted to 24-tenths inches pressure, this life-test room being situated on the second floor and having its racks and hangers so arranged that it can accommodate 130 individual lights, either upright or inverted, and 32 hanging lamps or clusters. The other outlet from the mixed gas meter leads directly to a manifold where it is joined by outlet pipes from the coal gas meter and the water gas meter. From this manifold it is possible to deliver holder pressure gas at from 5-inch to 12-inch pressure to any room or photometer in the building as well as to the other testing instruments. From this manifold, also, gas may be passed to either of the two small storage holders, each having a capacity of 120 cubic feet. These holders are for the purpose of storing samples of gas, and it is thought that their content will be ample to finish any experiment requiring a constant quality of gas. Once a sample is stored in these holders, it is possible to test its specific gravity, calorific value and photogenic value with the least delay.

For the purpose of testing specific gravity, the "Referees' Effusion Test" is employed, in which the gas is allowed to escape through a small pin-pricked hole in a piece of platinum, and its rate of discharge as compared with that of air determines its gravity.

In determining its calorific value, a Junkers calorimeter is used, which has been built into a cabinet having an overhead tank with a capacity of 10 cubic feet. In this tank, water stored for testing purposes reaches the temperature of the room in which the calorific value is being determined, thereby avoiding a common error due to the failure to keep the inlet water and the spent products of combustion at the temperature of the air in the surrounding room. It also permits a constant water pressure, insuring a steady flow through the calorimeter. A glass vessel having a capacity of 10 pounds is so graduated as to be read to the nearest one-hundredth of a pound, and this is used in the collection of the heated water. The thermometers used are with the Fahrenheit scale, reading to one-tenth of a degree, and have been calibrated by the Bureau of Standards at Washington. Overflow devices have been attached which insure an easy and cleanly transfer of the outgoing stream from the glass measure to the waste pipe.

The photogenic value of the gas is determined in a nearby room where a 60-inch bar photometer has been installed for this purpose only. To prove from time to time the accuracy of the different meters used, a 5-foot standard meter prover has been installed capable of testing to an accuracy of 1 per cent.

Life Tests.—Life tests of mantles, lamps and their appliances are conducted in two ways; those intended for interior use are hung or placed in the life-test room on the second floor of the building. These test-racks have been made by using 2½-inch pipe and tapping in vertically at 6-inch intervals, using ¾-inch nipples and gas cocks pointing upward. The hanging lamps are suspended from 2½-inch pipes overhead similarly tapped, but with the outlets, of course, pointing downward and the distance between taps 30 inches.

There has been installed a 100-inch bar photometer with a direct reading scale, which may have for its standard either a pentane lamp or an electric incandescent lamp. A special hanging bracket has been devised, giving motion in three directions, and having a ball-joint inserted below the point of suspension, so that any hanging lamp bearing one or more mantles may be suspended in place with-

Mr. Blauvelt—A number of matters in this report I think are not sufficiently clear, and some data appear to be incorrect. In Table No. II. the author gives equal heating values for Pittsburgh coke, gas coke (egg size), gas coke (nut size) and nut size heavy draft, all being 12,183 B.T.U. In the last column of that same table Pittsburgh coke was given as 16 5/16 per cent. ash, gas coke, egg size, was 10 1/16 per cent. ash, and gas coke, nut size, was 11 1/16 per cent. ash. It is obvious that with the varying percentages of ash the B.T.U.'s per cent. of the various cokes tested could not have been the same. As I understand it these efficiencies given are obtained by dividing the number of B.T.U.'s absorbed by the water by the heat units carried by the fuel. If that is the case you will get the wrong answer if you don't start right, and it is obvious that these different cokes cannot all have the same heating value. This error tends to lessen the value of the paper. I would like to ask if there was any allowance for moisture carried by the various cokes used.

Mr. Wyman—There was no moisture determined.

Mr. Blauvelt—The percentage of moisture varies quite a good deal, and additional value would have been given the report if that had been determined. Regarding the conclusions reached, while these are rather more favorable to coke than we would have expected, yet we should have expected to get a higher heating value in a house heating appliance from coke than from anthracite, as was obtained in carefully conducted tests that were made at the University of Illinois, under the supervision of the U. S. Geological Survey. Many of you have possibly seen the pamphlet describing these tests. I was much surprised that more use was not made of it in our business, because tests were made there with coke, anthracite coal and the various soft coals to determine the actual comparative value of the different fuels used in house heating appliances in that section of the country. In that test they figured all the fuels back to a common price basis, as though they cost the same per ton and gave the relative heating values if they cost the same per ton. The results showed that of all house heating fuels you can afford to pay a slightly higher price for Pocahontas coal than for any other fuel, which is due, of course, to its high heating power. The next highest was coke, anthracite coal third, or if at a certain place Pocahontas coal costs $5 per ton, and anthracite is actually worth $4.56, coke, $4.64, and Pennsylvania coal, $4 80; if anthracite sells at this same place at $8, it is a luxury by $3.44 over Pocahontas. At another place, should anthracite cost $8.20 per ton, the Pocahontas coal would be worth $9 a ton, good Pennsylvania coal, $8.65, coke, $8.35, and good Illinois coal, $5.33. The tests were made in a similar boiler to the one used by Dr. Wyman.

Mr. Ewing—In connection with Mr. Blauvelt's statement, as I remember it, anthracite coal was quoted as a luxury by $2.44 a ton. In other words you could afford to pay $2.44 per ton more for coke than you could for hard coal to get exactly the same heat efficiency. That pamphlet is one that can be had by writing the U. S. Geological Survey, and it gives tests on carbon that were very complete along this line.

Mr. Wyman—As to Mr. Blauvelt's remarks touching upon the fact that the same number of B.T.U.'s are stated in my report to be contained in the different kinds of coke mentioned, I will say we did not have the apparatus necessary to make an accurate analysis. The boiler used in our tests was named as a hard coal boiler in the catalogue of the American Radiator Company. Their coke boiler has a considerably larger firebox and the capacity for coke would be much higher if we had a coke boiler.

Mr. Douglas—I think I can explain Mr. Blauvelt's criticisms as to the different amounts of ash contained in the coke where they had the same theoretical heating values. The coke was not burned to a complete ash in any case. The fire was drawn after the capacity began to go down and the coke picked out from the ash. Every piece of coke would have, of course, some ash from it, which would explain the difference. We had no apparatus for carefully and scientifically determining, and we went through the different tests, running them as they would be run in a house, so as to get results that anybody could obtain.

Mr. Schaddelee—In the case of anthracite. In the same furnace they combusted 185 pounds of anthracite in 8 hours, and as low as 75 pounds of coke in 6 hours, so that the rate of combustion was much more rapid in coal than in coke, which is also shown by the higher heat of the two gases.

On motion of Mr. Frazer a vote of thanks was passed to Mr. Wyman for his most interesting and valuable paper.

(To be Continued.)

Employees' Associations.[1]

[By Mr. Clare N. Stannard, Sec. Denver Gas and Electric Co.]

One of the first steps taken by Henry L. Doherty and Company, upon the acquiring of a property, is the organizing of one or more employees' associations. This has repeatedly proven a wise and profitable measure, for invariably it materially promotes the employees' and company's interests. A small company usually maintains one employees' association and incorporates in that organization several important objects. A large company can maintain a number of different organizations. Briefly mentioned, the important points covered by the work might be incorporated in the following: First, social association; second, mutual aid association; third, educational association.

As before mentioned, a small company might form an association covering the three subjects, while a large company should have three separate organizations to individually promote each of the subjects mentioned. We believe the association should be officered and managed by the employees of the company, consisting of chairman, vice chairman, secretary and treasurer, the officers holding their positions for one month's time; thus enabling various ones to have the beneficial experience occasioned by being officers of the association.

First: Social Association.—Under this heading we believe it is wise for the employees to frequently meet in a social way and become acquainted. It has been found profitable for the employees to give parties, social dances, etc. Relaxation from continuous business cares results in employees becoming acquainted with one another, and more willing to co operate. This co-operation also extends to more friendly relation between the departments of the company.

The establishment of baseball teams and bowling leagues, and by the yonng ladies a basket ball team, has a tendency to promote sociability, not only between the employees, but by the opposing teams whom they may meet. It also provides inexpensive and excellent advertising for the company supporting the teams.

Second: Mutual Aid Association.—Its object is best expressed by stating Article 2 of a well-known gas company's mutual aid association, which reads: "The object of this association shall be to provide assistance to members in case of illness, disability or death." The members of this association pay a small monthly assessment, as per the following: Those receiving $50 per month or less, 30 cents; over $50 and not more than $75, 50 cents; over $75 per month, 80 cents. The gas company donates to the mutual aid association a sum equal to 25 per cent. of the monthly collections paid in to the association by the employees.

From the dues thus collected the employees receive the following benefits: The association pays their doctor bills, prescriptions, nurse and hospital bills; such bills, however, are limited to a total sum of $110; and, in case of death, an additional benefit of $100 is paid. In addition a calling committee is appointed, whose duty it is to call upon the sick, sending them flowers and renderiug all aid and assistance possible.

The association is the means of doing a vast amount of excellent work, which is greatly appreciated by the members benefited. It promotes thrift and the proper independence of the employees.

In addition to the officers above mentioned we believe this organization should be governed by a board of directors, who should meet monthly and pass upon all bills and applications for aid.

Third: Educational Association.—At one time gas companies paid little attention to the education of its employees; this condition has changed, and at the present time great stress is rightfully laid on the subject of education.

Some name similar to the following might be given the organization; namely, Commercial Council. The council formed should have permanent officers; the meetings should be presided over by the chairman, and conducted along the lines of parliamentary law. Educational matters should be taken up and discussed, papers of interest presented, and debates on important subjects. It is profitable to take up matters in connection with the gas business, aside from those of a purely commercial nature. For instance, we should advise through the council the study of the manufacture and distribution of gas, bookkeeping, office methods and accounting.

In addition to the features just mentioned, it might be well to incorporate in the work some or all features found in the scientific study of salesmanship, a course of illuminating engineering, and a

1. October "Bulletin," Nat. Com. Gas Association.

thorough study of all principles involved in supply of gas for fuel, light and power.

This organization will, first, develop the representative; second, create system and organization; third, promote intelligent discussion; fourth, create and maintain enthusiasm and efficient salesmanship.

1. Developing the representatives by their attending and taking part at all meetings, which makes it easier for them to talk in public. Through the men knowing that they are expected to take part, they come prepared to do so, which necessitates their talking intelligently upon all subjects and matters discussed. Attendance at meetings, thus learning what others are doing, stimulates favorable competition.

2. Creates system and organization. In order to attain the highest degree of efficiency and success in any line of business it must be managed along the lines of perfect organization. If the men are managed at the meetings by intelligent direction, they soon discover a perfect system and organization are being maintained. They understand that orders given are not meaningless, but that they must be obeyed, and when we once obtain and maintain this class of system, organization and discipline, we have done much to make our work successful.

3. Promotes intelligent discussion at the meetings. By men taking part who possess original ideas, they are afforded an opportunity of mentioning them, and in this way the company discovers the men who do not possess ability or originality; and, most important, we learn who are our real thinkers. New plans are continually being proposed by the new men, which are in turn discussed by the management, and those thought to be good acted upon. These discussions promote mutual encouragement and assistance.

4. Creates and maintains enthusiasm and efficient salesmanship.

The holding of frequent meetings and the enthusiasm and interest created by the discussion invariably cause the men to leave the meeting with a great desire to immediately close some good contract. Take, for instance, the new man desirous of immediately showing us that he also possesses a degree of salesmanship equal to that of some representative who has just told of having secured a large contract.

We believe in having frequent talks, calculated to inspire the men with enthusiasm, and giving them talks on what enthusiasm means. Again, take up the subject of personal magnetism and treat it in the same manner as enthusiasm.

Salesmanship should be frequently discussed and the men be shown what qualities they should possess to become successful sales men. These talks are all for the purpose of creating a desire to excell in the possession of enthusiasm, magnetism and salesmanship.

Associations established along the above described lines give us a perfect organization, system and discipline, lessens our costs and greatly increases our efficiency.

The Photometrical Laboratory of the United Gas Improvement Company.

[Abstract of a paper read by MR. C. O. BOND at the Third Annual Convention, Illuminating Engineering Society.]

It is only within the past 10 years that much interest has been aroused as to the efficiency of the different sources of light. Whether the light was intended for interior illumination or for street or decorative illumination, the people have been satisfied with such illuminants as have been furnished them, provided they were not too expensive; but, with the age of invention in electric and gas and oil sources of light, and their distribution, there has come upon the market a great variety of lamps suited for various purposes, and the most extravagant claims have been made for some of these. Of course, this resulted in strong competition, and it became necessary to establish suitable referees who would be able to decide whether or not these claims were truthful. Out of this need for referees grew the photometrical laboratories, of which several excellent ones now exist in this country. It would be difficult, however, for any one laboratory to successfully undertake the photometering of lamps having, as their sources of energy, all the different illuminants before mentioned. Particularly would this be difficult in the case of gas, the different kinds of which are not readily transportable in sufficient quantity to meet the purpose of testing.

This laboratory (that of the United Gas Improvement Company) is situated in a 2-story and basement building, about 26 by 100 feet, within the Point Breeze gas works, in the city of Philadelphia. One of the objections to placing a laboratory within the confines of the gas works was that the atmosphere would at times undoubtedly be smoke-laden, and to overcome this objection the doors and windows of the laboratory are all made double sashed and as tight as possible. The air entering the building will be thoroughly filtered, and by means of a ventilating fan put under such pressure that all tendency to leakage will be outward and not inward, thus avoiding, as far as possible, the accumulation of dust and obviating the smoke nuisance By having such a control, also, of the air entering the building, it will be possible on very humid days to considerably reduce the humidity as the air enters.

One of the basement rooms was plastered throughout, provided with double doors between it and the other basement, and given an ample ventilating stack. In this room has been placed the first installment of a storage battery meeting all present requirements. This battery is composed of 74 cells arranged in 4 sections of 13 cells each and 22 end cells, giving a total voltage of about 150 volts. The battery is charged from a direct current generator situated within the works. This battery is so wired that any voltage may be obtained from 2 to its total capacity, and a distributing switchboard has been devised which enables current to be delivered to any of the 12 terminals in the building.

The basement room, in the other end of the building, is the inlet room for coal gas, water gas and mixed gas, compressed air, water and steam. The mixed gas is delivered through a 2½-inch pipe, and passes through what is known as a "60-A" meter, capable of passing 1,800 cubic feet of gas per hour. This mixed gas is led from a 3,000,000 foot holder nearby. The meter has 2 outlets; one to a life-test room through a governor adjusted to 24-tenths inches pressure, this life-test room being situated on the second floor and having its racks and hangers so arranged that it can accommodate 130 individual lights, either upright or inverted, and 32 hanging lamps or clusters. The other outlet from the mixed gas meter leads directly to a manifold where it is joined by outlet pipes from the coal gas meter and the water gas meter. From this manifold it is possible to deliver holder pressure gas at from 5-inch to 12-inch pressure to any room or photometer in the building as well as to the other testing instruments. From this manifold, also, gas may be passed to either of the two small storage holders, each having a capacity of 120 cubic feet. These holders are for the purpose of storing samples of gas, and it is thought that their content will be ample to finish any experiment requiring a constant quality of gas. Once a sample is stored in these holders, it is possible to test its specific gravity, calorific value and photogenic value with the least delay.

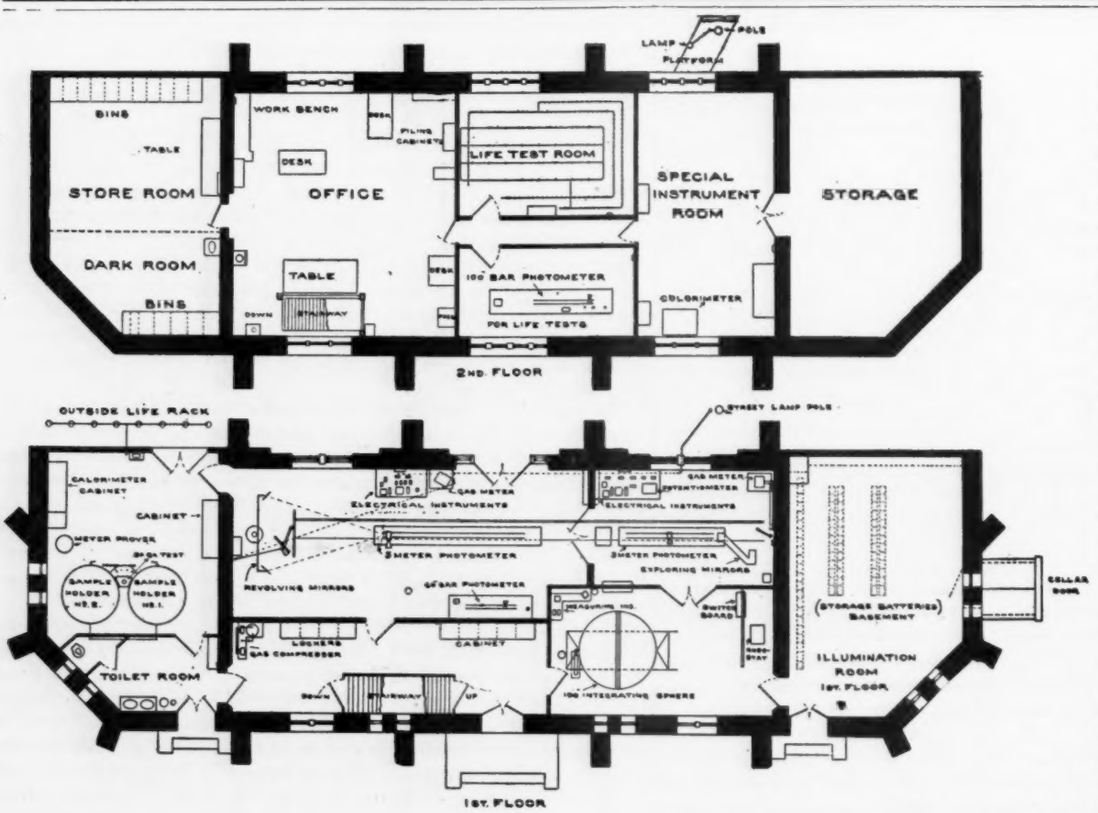
For the purpose of testing specific gravity, the "Referees' Effusion Test" is employed, in which the gas is allowed to escape through a small pin-pricked hole in a piece of platinum, and its rate of discharge as compared with that of air determines its gravity.

In determining its calorific value, a Junkers calorimeter is used, which has been built into a cabinet having an overhead tank with a capacity of 10 cubic feet. In this tank, water stored for testing purposes reaches the temperature of the room in which the calorific value is being determined, thereby avoiding a common error due to the failure to keep the inlet water and the spent products of combustion at the temperature of the air in the surrounding room. It also permits a constant water pressure, insuring a steady flow through the calorimeter. A glass vessel having a capacity of 10 pounds is so graduated as to be read to the nearest one-hundredth of a pound, and this is used in the collection of the heated water. The thermometers used are with the Fahrenheit scale, reading to one-tenth of a degree, and have been calibrated by the Bureau of Standards at Washington. Overflow devices have been attached which insure an easy and cleanly transfer of the outgoing stream from the glass measure to the waste pipe.

The photogenic value of the gas is determined in a nearby room where a 60-inch bar photometer has been installed for this purpose only. To prove from time to time the accuracy of the different meters used, a 5-foot standard meter prover has been installed capable of testing to an accuracy of 1 per cent.

Life Tests.—Life tests of mantles, lamps and their appliances are conducted in two ways; those intended for interior use are hung or placed in the life-test room on the second floor of the building. These test-racks have been made by using 2½-inch pipe and tapping in vertically at 6-inch intervals, using ⅛-inch nipples and gas cocks pointing upward. The hanging lamps are suspended from 2½-inch pipes overhead similarly tapped, but with the outlets, of course, pointing downward and the distance between taps 30 inches.

There has been installed a 100-inch bar photometer with a direct reading scale, which may have for its standard either a pentane lamp or an electric incandescent lamp. A special hanging bracket has been devised, giving motion in three directions, and having a ball-joint inserted below the point of suspension, so that any hanging lamp bearing one or more mantles may be suspended in place with-



out difficulty, and rotated about this point after suspension, for the determination of horizontal candle power of mantles.

In life test mantle work the candle power determinations are made initially, at the end of 24 hours, 100 hours, 250 hours, 500 hours and 1,000 hours, and sufficient numbers of mantles of each kind are supplied for tests, so that the breakage of the mantles upon the bumping machine may be made at the end of any one or all of these periods.

Two bumping machines are necessary in these tests; one for the upright mantle and one for the inverted type of mantle. And while they are simple in construction, yet they must be accurately adjusted and maintained in adjustment if any dependence is to be placed on the results of breakage obtained upon them. The force made use of for breakage is that of gravity, the bar upon which the mantle is supported falling a definite distance, the repetition of this fall being accomplished at a regular speed, so that oscillations of the mantle, and any tendency after each jar for it to regain a quiet state, shall at all times be equal.

The second phase of life testing is that conducted on outside lamps. In order to care for these lamps a line of 1½-inch pipe has been hung outside and at the rear of the laboratory, at a height of about 18 feet from the ground.

This laboratory is situated at Point Breeze, and the place well deserves its name. When one considers the high winds that prevail there, the dust that is flying and the eddies of air that sweep between the different buildings, partially induced by the high gasholders containing great quantities of metal, it can be seen that, when an outside lamp is submitted for test, and is subjected to this unusually rough treatment, if it has any weak points they are sure to develop. These lamps are tended as they would be if regularly in service, and at the expiration of regular intervals they are brought within the building, thoroughly photometered and inspected, and note made of their performance.

There have recently come to the laboratory, for outside tests, other lamps of high candle power, requiring the use of a gas compressor to operate them. As these are intended for street purposes, and are hung much higher, this object has been obtained by the use of telegraph poles, with a 2-inch pipe—a gooseneck at its top—and adjustable to any height between a range of 20 to 35 feet. These high pressure lamps are of a foreign type, and the mantles intended for use in them come in a soft state, being as yet unburnt and not hardened. In this state they are hydroscopic, and before being placed or ignited for test, it is necessary to put them in a drying chamber which is provided for this purpose.

The laboratory has been equipped with a gas compressor operated by an electric motor. This compressor draws gas from the manifold earlier referred to, raises it to any pressure required up to 10 pounds, forces the gas into a compression tank fitted with a relief valve, so adjusted that, when above a certain pressure, the escaping gas will return to the inlet of the gas compressor. Another opening in the compression tank leads to a governor which is adjusted delicately to the pressure required by the particular lamp under test, and on the outlet of the governor is placed a mercury gauge to indicate the maintenance of this pressure. In order that gas when in this compressed state might be accurately metered, 4 specially constructed wet meters have been provided; two having a capacity of ¼ cubic foot per revolution; one having a capacity of 1 cubic foot per revolution, and 1 having a capacity of 2 cubic feet per revolution. These meters are capable of sustaining pressures up to 5 pounds per square inch without inaccuracy of registration. This feature we consider important, as it avoids the calculation of volumes where such calculations as a rule will be more or less in error.

Special Photometers.—The laboratory is also equipped with a Sharp-Millar portable photometer, and with a Weber portable photometer. Besides these, three fixed photometers, for the determination of light distribution, have been installed. One is an integrating sphere provided by Sharp and Millar, having a diameter of 100 inches, and so arranged with ventilated bottom and top as to include gas lamps of the largest type so far produced. This sphere is divided vertically into two hemispheres, one of which remains immovable and has attached to it the photometric devices proper, as well as the piping upon which are suspended the various lamps introduced for testing. The other hemisphere, although quite heavily constructed of metal and angle irons, moves free and easily with ball bearings upon a track in such a way as to engage the fixed hemisphere at once in a light-tight closure. The interior of the sphere is painted a non-lustrous white, and the intention is, of course, to be able to determine the mean spherical candle power at one reading. This marks a strictly new departure in photometry as applied to gas lamps.

In two rooms, having a total length of 60 feet and arranged with large doors so that they can be opened into one room, there has been placed, and leveled, a track running the entire length of these rooms. In the larger one, which is 40 feet long, there has been fully equipped a 5-m. photometer constructed by the Leeds & Northrup Company. The rails and scale of this photometer rest upon a table 18 feet long, solidly built of oak. The table itself moves with ball bearings. The photometer rails are of the Reichsanstaldt pattern and the scales attacked to them are two in number; one a 5-m. scale, graduated in half-centimeters, the other 4-m. in length, graduated as a direct reading scale. Upon this photometer track are placed the usual screens and carriages, both for the standard lamps and for the photometer heads. These carriages are of 3-wheel pattern with vertical adjustment of the socket. One photometer carrier is provided with three metal screens on each side, travelling with the carriage. Each of the photometer carriages is also provided with a small bug lamp for illuminating the scale after the setting.

At the west end of the 40-foot room has been placed a type of reflecting mirror which we consider an improvement upon the multiple mirror system. Two mirrors 18 inches square, rotate on arms hav-

ing their centers at a distance of 4 feet from the axis of rotation opposite the light center. These mirrors are mounted on a tripod metal backing, capable of adjustment, and this metal backing is also capable of rotation through 90°, in order that the reflected light may be thrown nearer or further down the room to the photometer screen. The two backings are fixed on arms extended from metal disks, these disks having accurately placed stop holes at 15° intervals, so that in obtaining the distribution curve of a lamp it is possible to use one mirror as an exploring mirror throughout the entire range of 360°, or, starting from the 15° vertical position, it is possible to have the two mirrors move in semaphore fashion down to the 15° nadir position. Thus, while securing most of the benefits of the multiple mirror type of photometer, there is cancelled the difficulty and trouble of determining and checking the numerous co-efficiencients that are necessary with the multiple mirror system. The lamp to be tested is suspended by means of a 2-inch pipe from the ceiling high above it. A collar slides upon this pipe, giving vertical adjustment and rotating motion. Attached to this collar is a tee through which slides another pipe, giving radial adjustment in distance from this vertical pipe. From one end of this horizontal pipe hangs the lamp to be tested, a ball joint intervening, and into the other end of this horizontal pipe is fed the gas supply from a flexible metallic hose connection. By this means only one of the 15° zenith positions of the light is interfered with. Hanging from this same vertical pipe, also by means of another horizontal arm, is the circular screen, which prevents the horizontal direct ray from reaching the photometer head. The center of the screen can be removed so that if desired the direct horizontal candle power of the lamp may be taken. Centrally, placed on one side of the room and underneath two pair of the switchboard terminals above spoken of, is a table 30 inches by 66 inches, whereon are placed the necessary electrical measuring instruments, voltmeter, shunt, ammeter, as well as the various switches to properly control the electric comparison standards, or, if need be, an electric lamp submitted for test. The wires leading from this measuring table are carried in conduits underneath the floor and rise through appropriate floor sockets to their correct positions under the photometer tables.

In the second of the two rooms above mentioned, which is 20 feet in length, has been installed the standard photometer which is intended to be our instrument of highest accuracy. Instead of a pair of mirrors for exploring the distribution curve of a lamp, there is placed here a pair of mirrors mounted in one metalic tube in such a way that, while revolving about the light source, the rays are always brought for comparative purposes to a horizontal direction. This exploring device will be used for smaller light sources, particularly single mantles and small clusters. The photometer track itself is 3 meters long, but the graduation at each end of the scale begins at 1 meter, so that the light centers of this photometer will be placed at a distance of 5 meters.

The revolving mirror device just spoken of is clamped on the track at one end in a manner similar to the other carriages, but without wheels. The electrical instrument table for this photometer is 30 inches by 84 inches, and contains, in addition to the instruments mentioned for the 5-meter photometer, a potentiometer and galvanometer attachment, the light spot traveling a graduated arc. This photometer also is of L. & N. make.

These last two photometer rooms, as well as that in which the 100-inch bar is situated, have their walls and ceilings painted a dead black and their floors a dark grey. From the fact that all windows in the buildings are made double-sashed, it has been possible to provide complete darkness of room and yet have the possibility of a very light room and at the same time not admit draughts of air. This was easily done by painting the inside window glass with several coats of dead black, and we are finding it more satisfactory than if it had been wooden or other kinds of shutters, from the fact that the glass will show no shrinkage and light streaks.

Besides electric incandescent standard lamps for horizontal and for mean spherical candle power determinations, this Laboratory possesses valuable flame standards as follows:

One Hefner amyl-acetate lamp, certified by Reichsanstalt.
One Carcel lamp, complete, certified by Laboratoire Centrale, Paris.
One Chance Bros. pentane 10-candle power standard, certified by the Secretary of the London Gas Referees, Prof. W. J. A. Butterfield.
One Sugg 10-candle pentane standard lamp, certified by the London Gas Referees and by the British National Physical Labortory.

This completes the exclusively photometric equipment of the laboratory. One room, however, about 20 feet, by 25 feet has been fitted up as an illumination room. A false ceiling has been built of framework similar to stage scenery, which is capable of elevation to any height up to 20 feet, and a movable partition is arranged at one end. The framework is covered with canvas duck, and by either painting or papering—as the case may be—it will be possible to simulate almost any room for whatever purpose it may be used. The ceiling of this illumination room has 21 gas outlets at equal spaces, and half-way up the walls is placed a line of pipe with plugged tees pointing out, from which attachment may be had for any wall bracket desired. By means of flexible hose and gas piping suspended with pulleys and sash cord leading to a pin rail it is possible to raise or lower the ceiling lights to any desired position.

One feature in connection with this is the employment of an Ives colorimeter, so that, in case the room should simulate a display room for rugs or dry goods, the colorimeter will be able to indicate the color value for the type of illumination used.

In addition to the equipment above described, it has been necessary to build a work bench with a supply of the various tools that are needed for making slight repairs, alterations, drilling, boring, soldering, bending, punching, etc., necessary where gas lamps are to be handled.

The laboratory is not yet completed, nor does it seem likely that it will be, as the policy which is responsible for its beginning likewise stands back of its development and hopes to keep it keyed and equipped for the many and varied problems which are ahead in the broad field of illuminating engineering.[1]

[Concluded from Page 914.]

Recent Practice in Coal and Coke Handling in British Gas Works.

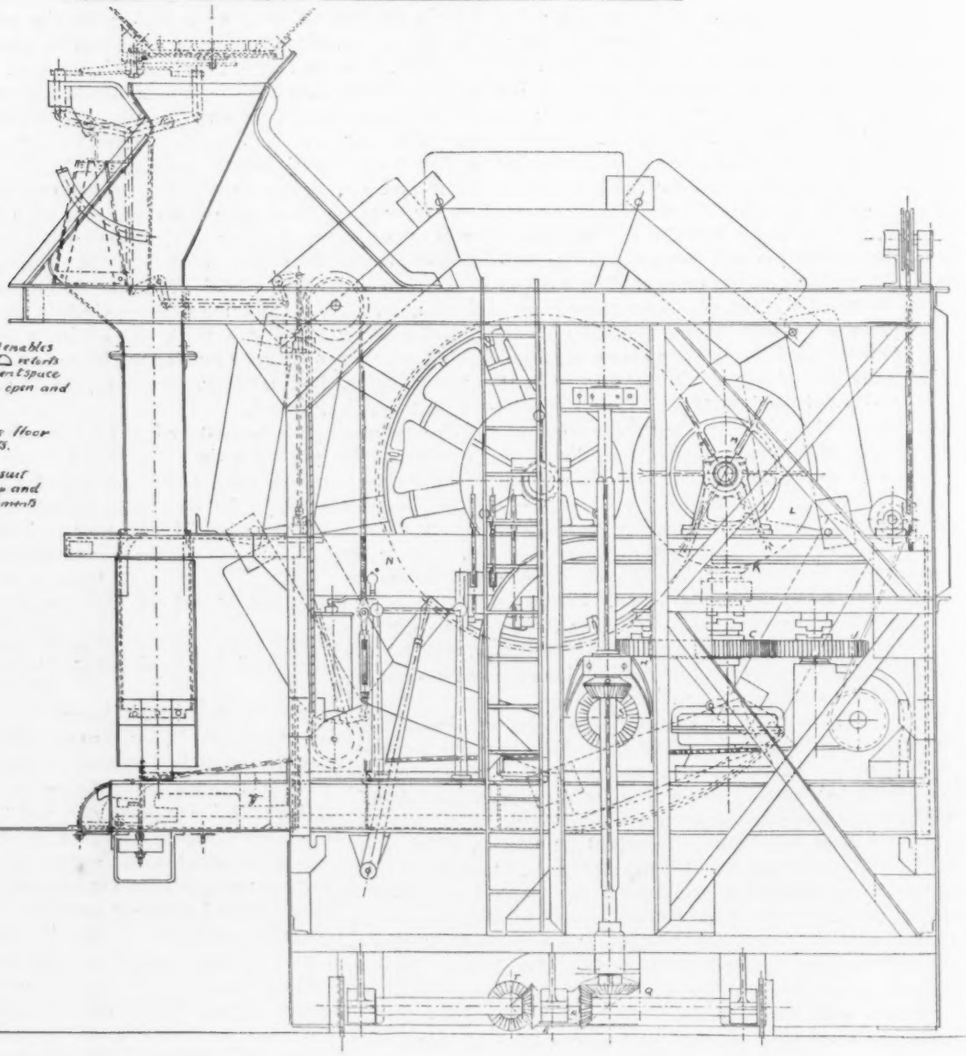
[Prepared for the JOURNAL, by MR. JAMES I. SEAGER, Newcastle-on-Tyne, England.]

West's Machines.—Usually in English gas works retort benches are "throughs," that is to say, the retorts have a mouthpiece at each end, in which case a charging machine and a drawing machine are worked at each side of the bench. Where the retorts are not "thorough," but have one end "stopped," then only one pair of machines is required. The type of machine which is suitable varies to a great extent with the size and arrangement of the retort house. For retorts up to 10 feet in length, it is English practice to use manual charging and erawing machines, usually of the scoop type. The charging machine is generally provided with apparatus for distributing the coal in an even layer in the retorts, and a hopper which takes a supply of coal from an overhead fixed hopper. Manual power gear is used for traversing the charger and adjusting it to the retorts, while to adjust to the height of the retort a belt connection to the coal elevator is usually made. In retorts over 10 and up to 20 feet in length, a charging and drawing machine, if manual, is placed at each side of the row of retorts. Where the number of retorts is increased to such an extent that manual labor is not sufficiently speedy, either separate power operated, charging and drawing machines are installed; or, in cases where there are furnaces on both sides of the retort stack, a charging machine is arranged on either side and a ram discharging and drawing machine brought into operation. Fig. 10 shows an English gas works retort house containing 30 settings of through retorts, or 600 mouthpieces. The furnaces are on both sides of the retort stack, and the coke is delivered into wagons below the stage floor and on both sides of the house. For this purpose West's compressed, air driven scoop charging machines, and combined drawing and discharging machines, are fitted. The latter is driven by compressed air and can either draw the coke towards the same side of the house as the machine or discharge the coke by a telescopic ram to the other side. The attendant stands between the drawing rake and the discharging ram and puts either into operation as may be required. A very interesting machine which is being adopted in the largest English gas works is the West's rotary charging machine, shown in Fig. 11. This is fitted with a rotary charger which projects the coal into the retort. It is constructed with a hopper to hold a considerable amount of coal (5 tons in the case illustrated) and used in cases where the overhead coal hoppers do not extend the full length of the retort bench. The speed of the charger is automatically governed, and the charge of coal weighed and registered The machine is fitted with either an electric or compressed air motor for travelling and adjusting the charger to the retort, and is used for retorts of any size or section up to 20 feet in length. The speed of the charger is mechanically governed by the

1. For discussion, see JOURNAL, October 4, 1909, p. 822.

FIDDES-ALDRIDGE SIMULTANEOUS RETORT DISCHARGING CHARGER

General Arrangement of Standard Machine



This Machine is constructed almost entirely of Steel with cast steel gearing, and so designed that any wearing parts can be readily replaced.

The length of chain (or ram conveyor) enables the machine to operate horizontal ◻ retorts of the maximum length with sufficient space between machine and mouthpiece to open and close lids.

The gauge of rails on Retort House floor may be varied to suit requirements.

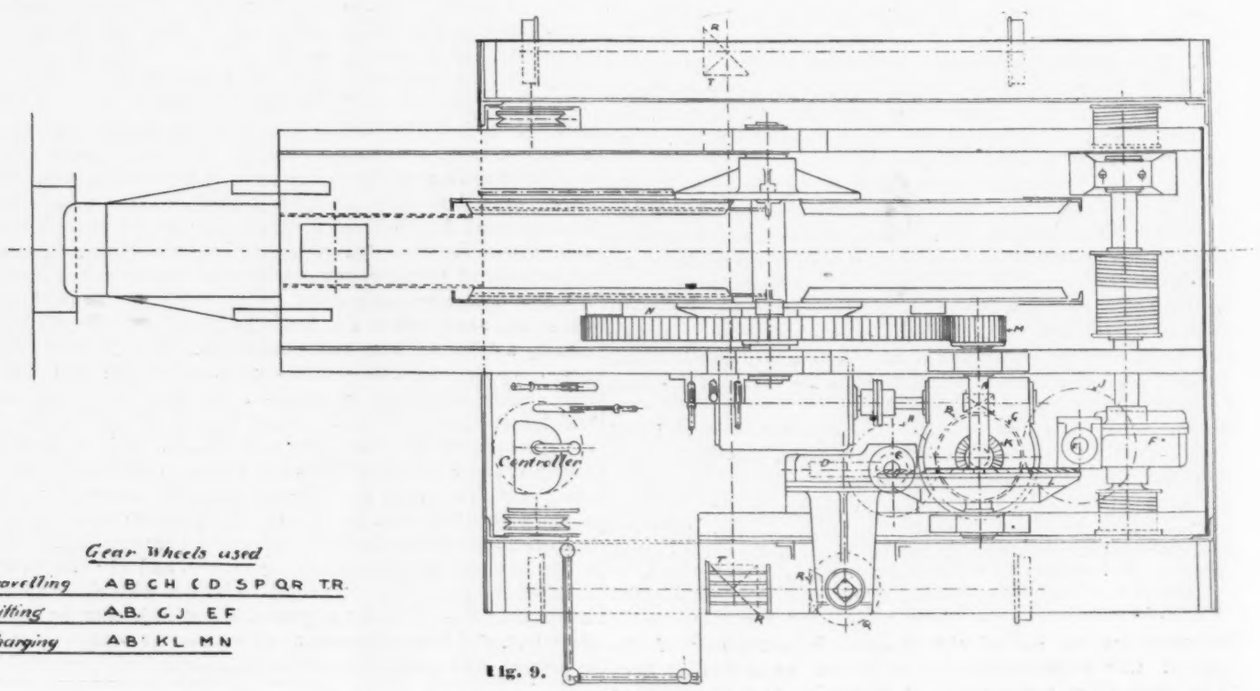
The Machine is elevated or lowered to suit varying retort levels and also travels up and down the House the whole of the movements being operated electrically and controlled by the driver on the machine platform.

The Machine is usually fitted with a measuring chamber but may if preferred be fitted with an automatic weigher or suitable hopper with a measuring chamber the machine can be made to automatically open and close the hopper doors of the overhead fixed hopper taking only the required charge of coal at each opening as the machine travels along the House

The machine is fitted with a 13.5 B.H.P. Electric Motor taking power from two overhead bare copper wires suspended from end to end of the Retort House.

Automatic overhead stoking gear (shown in dotted lines) is fixed to measuring chamber to operate doors simultaneously from floor level.

If four or five tiers of retorts are in use the outer frame of Machine is increased in Weight accordingly.



Gear Wheels used

Travelling	A B CH C D S P Q R T R
Lifting	A B. C J E F
Charging	A B K L M N

Fig. 9.

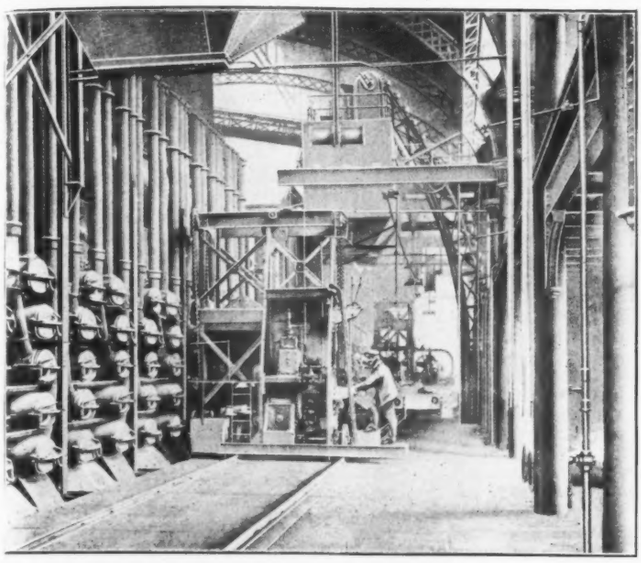


Fig. 10.

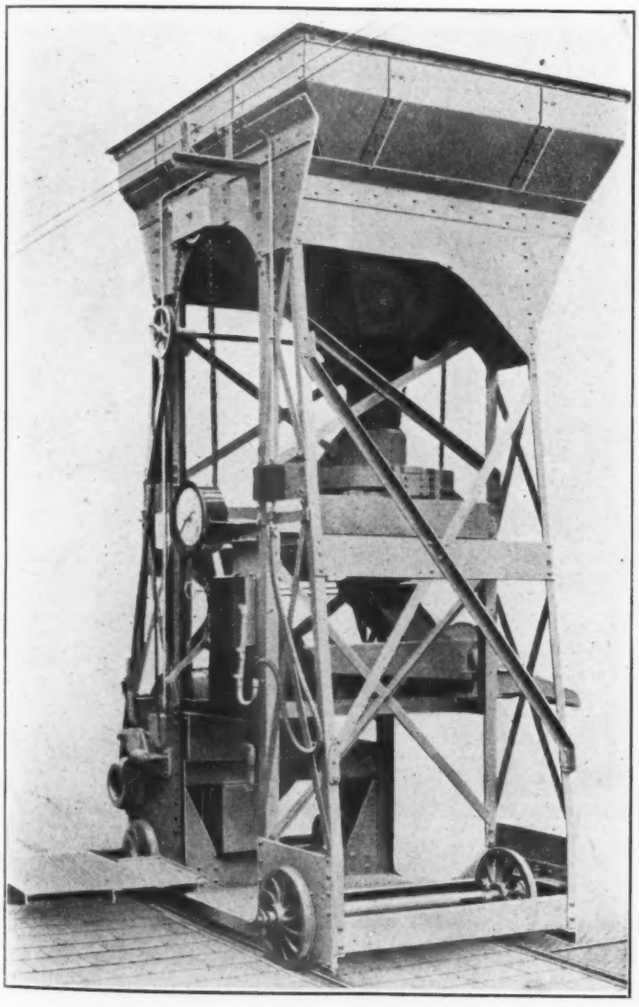


Fig. 11.

weight of the charge of coal, and its action is independent of any control by the machine attendant. Both these machines are largely used where there is only a narrow space in front of the retorts.

As an instance of the way in which West's machines are used may be cited the installations at the works of the Cardiff Gas Light Company. Here the coal arrives in wagons, on a high level siding, which serves both coal stores and retort house, the wagons being hauled by compressed air capstans, and discharged directly over the coal breakers, the empty wagons being hauled away by compressed air capstan gear. There are four coal breakers, each with elevator and conveyor, serving two overhead hoppers, one on each side of the retort house. The breakers are fixed in pits and are provided with mechanical feeders fitted with screens and shoots for by-passing the small coal to the elevators. These feeders permit a large quantity of coal to be stored over the breakers, at the same time feeding the coal in regular quantities, preventing overloading and choking of breakers and elevators. Each breaker, with its elevator and conveyor, is driven by a vertical steam engine with belt drives, and each line is capable of dealing with 20 tons of coal per hour.

The total capacity of the coke breaking plant is 80 tons per hour, and the hoppers have each a capacity for 40 tons, the 8 hoppers being of 320 tons capacity, or about 20 hours' supply for the charging machines. On each side of the retort house there is one charging and one drawing machine. The charging machine hoppers contain a supply of coal for 12 retorts and these and the drawing machines are driven by compressed air.

The compressing plant consists of two air compressors, each capable of driving the whole of the plant. They are of the 2-stage type, water cooled between the 2 stages. The suction and delivery air valves are mechanically operated. Each compressor is fitted with an air pressure speed regulation for a working pressure of 60 pounds per square inch. The compressed air is conveyed in pipes to receivers and overhead drums in the retort house and from these to the machines by flexible pipes.

The De Brouwer Machine.—The De Brouwer machine is of the projector type, very simple in mechanism and quite efficient. As will be seen from Fig. 12, it consists of a steel frame carrying a large

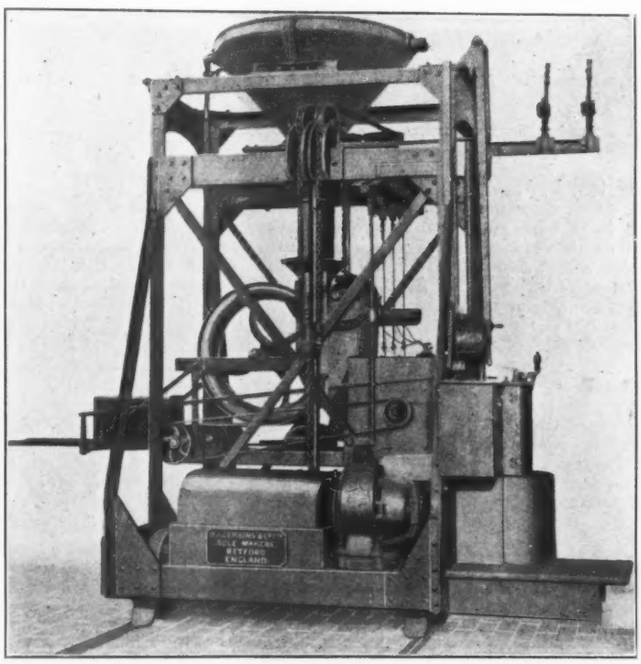


Fig. 12.

grooved pulley, three band pulleys for carrying an endless broad band, the small pulleys running inside the band and the large pulley on the outside, two flat surfaces outside the groove causing the pulley to rotate at the same speed as the band. The large pulley is about 39 inches diameter by 15 inches wide and the groove about 8 inches wide and 3¾ inches deep. The belt is rotated by an electric motor, and as soon as the necessary speed has been attained coal is dropped from the measuring chamber through a feeding shoot into the groove of the pulley and is kept from flying off by that portion of the belt encircling the pulley. The coal rapidly takes up the speed of the belt and also takes up the direction of the latter. When the belt changes its direction, to turn round the small guide pulley, the coal continues the straight line into the retort somewhat as the fashion of water from a hose. Eventually influenced by the gravity the coal slides along the retort and the friction brings it to rest. A stop of some kind is placed at the far end of the retort, which causes the coal to build up the thickness, increasing towards the mouthpiece nearest the machine. In order to obviate such uneveness and make a level charge the speed of the machines is gradually reduced until the whole of the coal has left the belt. The operation takes about 25 seconds.

The De Brouwer discharger consists of a telescopic ram in two lengths actuated by a rack and pinion and spur wheels, power being obtained from an electric motor, the whole mounted on a suitable frame. The two machines traverse the retort house by electric motor, the power being obtained from overhead feeders. These machines are in operation in a large number of British gas works, notably at Bristol, where three separate machines are installed, Paisley and Dublin, where two projectors and two pushers deal with 36 beds, the coal being supplied from the ground floor by an elevator fixed to the machine, which has a 5-ton hopper and double feeder.

The Arrol-Foulis System.—In the Arrol-Foulis system 2 machines are required for the two operations. Sir William Arrol, the eminent engineer, and the late Mr. William Foulis, gas engineer to the Glasgow Corporation, were associated in the evolution of these machines. The drawing machine (Fig. 13) consists of a horizontal beam carrying two hydraulic cylinders for operating the rake, one to drive it forward, the other to pull it back. The rake is suspended and guided by steel wire ropes running over pulleys. The lever actuating the valve for working the rake is so attached to the beam that the movement which sets the valve for the forward movement simultaneously depresses the back of the beam guiding the rake, thus raising the rake to allow it to pass over the coke in the retort. The reverse movement of the lever actuates the valve of the withdrawing cylinder, and also elevates the back of the beam so that the rake is lowered into the coke. Thus the working of one lever performs the four successive operations of raising, propelling, lowering and withdrawing the rake, whilst another lever raises and lowers the rake to suit the height of the retorts. The exhaust water from the hydraulic cylinders is passed into an overhead tank, from whence it is fed to a sprinkling apparatus used for cooling the rake and rod on each withdrawal. The whole charge is not brought out with one stroke, and at each successive stroke the rake passes further into the retort.

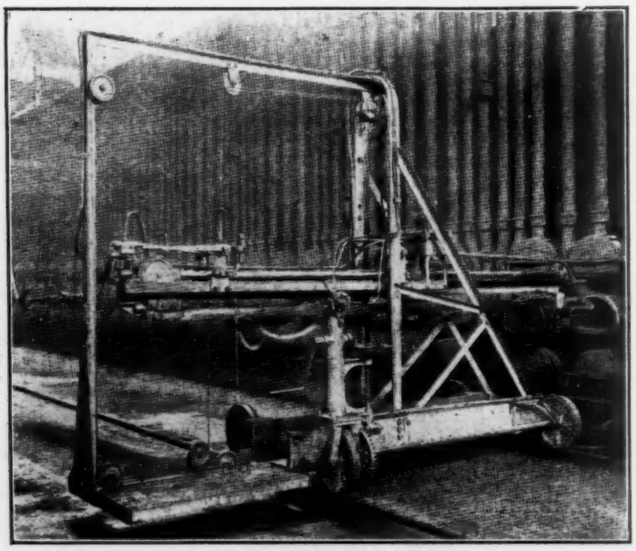


Fig. 13.

The charging machine (Fig. 14) consists of a framework of angle iron and channel iron, and carries a hopper for about 5 tons of coal, sufficient to charge about 20 retorts. The coal drops from the hopper on to the charging pan, which bridges the distance between the machine and retort through a revolving drum built of a series of plates radiating from the center, this drum being rotated by a hydraulic cylinder. As it falls on to the pan it is pushed into the retort by a "pusher" similar to the rake head, only larger, also actuated by a hydraulic ram. This ram, as well as all the others, is worked at a pressure of 400 pounds per square inch supplied by duplex H. P. pumping engine driving direct 4 single acting plunger pumps working into an accumulator. The coal is sent at the first stroke to a point about 12 inches from the back of the retort or the center, in the case of a "thorough" retort, and the successive charges are then deposited about 18 inches apart until the retort is charged. This is accomplished by a revolving shaft parallel with the charging ram having fixed upon it at equal distances stops or projectors placed radially out of line. These stops come successively in the path of the ram and shorten the stroke each time. All the levers for operating the valves are worked from one platform, and a retort can be charged from both ends simultaneously in about 20 seconds, with the time required for passing the machine from retort to retort and setting it to the required height, about 45 seconds. About 30 seconds are required to draw a charge, or 55 seconds with moving forward. If the charging machine follows up the drawing machine directly, the time between pulling off the doors to putting them on again after the operation will be about 2 minutes. The machines are traversed along the front of the retorts by hydraulic motors, the charging machine by a 4-horse power motor, at a speed of 70 feet per minute, and the drawing machine by a 1½-horse power motor, at 150 feet per minute.

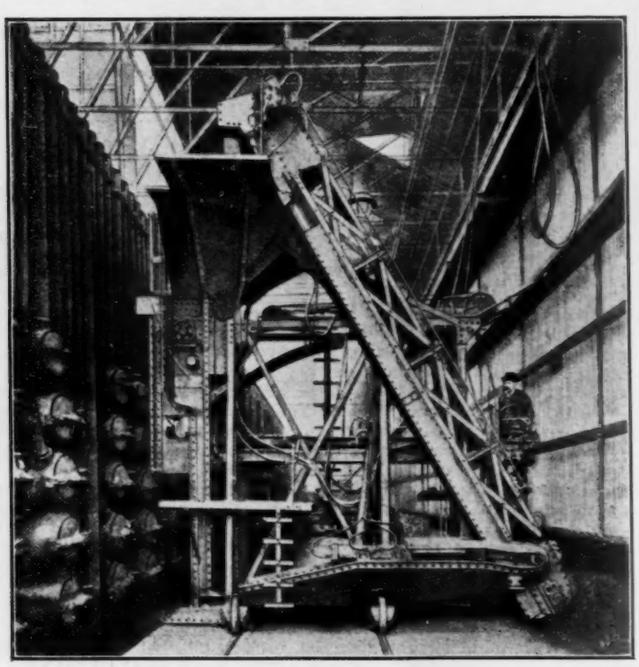


Fig. 14.

At the Beckton works of the London Gas Light and Coke Company, Limited, the coal wagons discharge into coal stores under the track at the side of the retort house, whence the fuel is conveyed by elevators to hoppers built over the retorts. The coal is fed from these through shoots to the hoppers on the Arrol-Foulis charging machines, of which at this works there are 16 and also 16 drawing machines. For regulating the supply there are fitted to each hopper shoot valves which are manipulated from the retort house floor. The total height is 55 feet, the width is 70 feet.

Another type of hydraulic coke pusher made by Sir William Arrol & Company, Limited, is the Hunter and Barnett patent hydraulic pusher for discharging retorts at one operation, shown in Fig. 15.

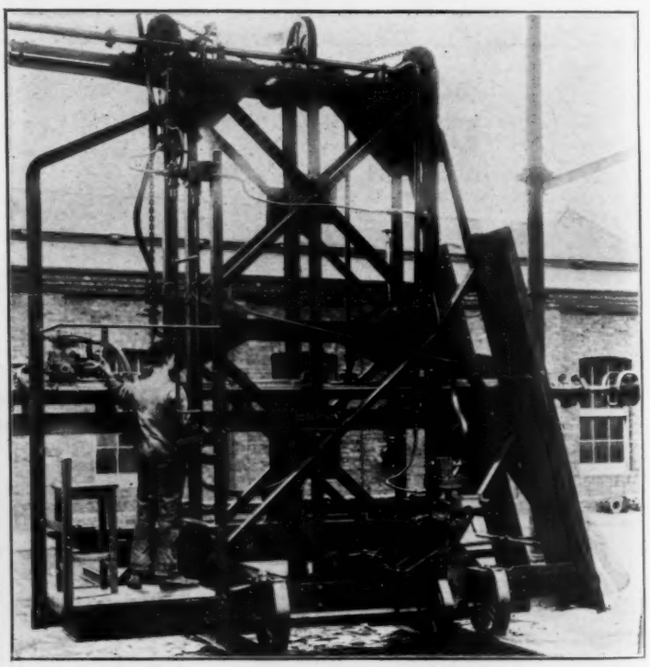


Fig. 15.

The machine consists of a substantial mild steel framing, rigidly connected together and attached to a carriage fitted with traversing wheels. The beam with actuating rams for working the pusher head is suspended from the top of the framing by suitable chains and pulleys, and receives its rising and falling motion to suit different heights of retorts from a horizontal hydraulic cylinder. The hydraulic rams for the pusher head are made telescopic, and have an internal drawback arrangement. The working stroke of these machines is usually for 20 feet through retorts, but it can be made to suit any length and height of retort required. The whole machine is self-contained and fitted with a 3-cylinder hydraulic motor for longitudinal traversing. A suitable platform is provided for attendant, with all working levels for valves placed in a convenient position. The water pressure and exhaust piping is arranged to suit the house the machine may be placed in.

Coke Handling Plant.—With the introduction of stoking machinery has come also the necessity for rapidly and continuously conveying the discharged coke away from the front of the retort benches, otherwise the advantage gained by speeding up the process of charging and discharging the retorts is lost, which is very certainly

the case if the old-fashioned method of wheeling the hot coke away in hand barrows is continued.

Again the increased competition for coke markets in large industrial centers, where many gas works under different authorities abound, has led to the introduction of coke breaking and coke screening machinery, the idea being to popularize the use of coke in the domestic hearth, by selling such broken into small pieces; in fact one London gas company is delivering broken coke in paper packets of 28 pounds each for use in the "flats" where the old-fashioned "coal cellar" is unknown. Hence arises the introduction of hot coke conveying plant and the more efficient mechanical arrangements for cheaper handling and saving labor in the coke store. The conveying of incandescent coke and its quenching during transit presented many difficulties, owing to the effect of sudden changes of temperature and the gritty nature of the material to be handled. Therefore, apparatus of an exceptional character is demanded to provide against an excessive wear-and-tear account, and the making of breeze dust is to be avoided as much as possible.

West's Coke Conveyor.—The hot coke conveyor, made by the West's Gas Improvement Company (Fig. 16), fulfills all these conditions and

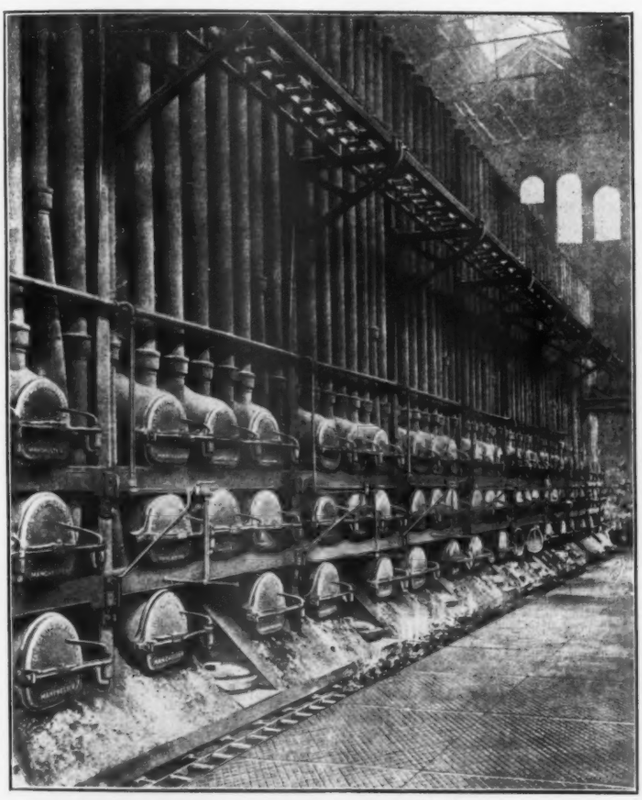


Fig. 16.

has stood the test of experience. It consists of a specially designed chain which slides along a trough, the greater portion of the coke being carried on the chain and very little being dragged along the trough; hence little breakage in transit results. The coke is quenched in transit and may be delivered into hoppers or skips, which may be afterwards handled by auxiliary plant. The chain is of simple design having joint pins with wide bearing surfaces and held in position by side links. The wear of the chain on the trough is minimized by cast iron shoes fitted to the chain. As the conveyor consists of a single chain the driving tension is centrally along the conveyor and the chain does not become distorted by the action of heat. A chain weighing 18 pounds per foot run has a maximum breaking stress of 24 tons. Each joint pin has a bearing area of 8.6 inches per foot run of chain. The trough of West's conveyor is constructed of steel channel or angle sides, and a steel plate bottom, on which is laid a hard, cast iron internal trough, which forms a renewable liner for the bottom and sides. The power required for driving is small, a conveyor of 150 feet length when conveying coke only requires 3 E. H. P.

A typical coke handling plant is that erected by Messrs. West's Gas Improvement Company, Limited, for the Cardiff Gas Light and Coke Company. In the retort house are four conveyors in front of the retort benches, fixed below the stage floor, which receive the hot coke as it is drawn from the retort by a West's discharging machine. On these four conveyors the coke is quenched in transit and these feed on to a cross conveyor and thence to an elevator for the coke hoppers, or feeds into skips for storing in the coke yard. The hoppers are capable of storing 400 tons of coke and are provided with revolving screens and breeze hoppers arranged to screen the coke at the point of delivery to railway wagons or carts.

In the coke yard, where 6,000 tons may be stored, is a travelling crane-gantry, 320 feet long and 26 feet above ground, the crane having travelling, slewing and derricking gears and a jib of 40 feet radius enabling a pile of coke 46 feet high to be raised. The total length of these conveyers is 1,120 feet.

Store Yard Gear.—In mid-winter, the coke often accumulates so rapidly that it is necessary to store large quantities in the yard, hoppers and screens being only useful when the demand balances the supply. For storing in the yard a travelling crane on an elevated gantry is exceedingly useful. Messrs. Smith, of Rodley, the well-known makers of travelling locomotive cranes, have put up many such in gas works for this purpose, one of which is shown in Fig. 17.

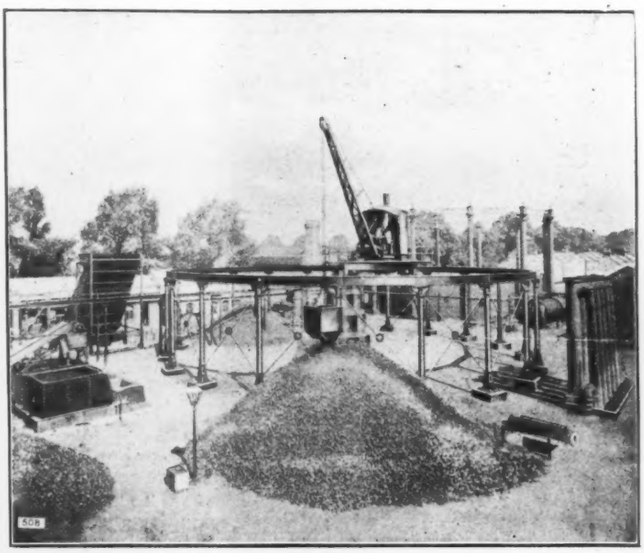


Fig. 17.

The jib has a variable radius of 14 to 30 feet, and will lift 2½ tons at 28 feet radius. The speed of hoisting is 130 feet per minute and it will travel about 300 feet per minute, the gearing being specially arranged to travel on a circular track. The internal wheel and roller path are of steel, the carriage is of cast iron with steel travelling wheels, steel axles and under gear, the gauge of wheels being 6 feet. An automatic load indicator and radius gear are fixed to the crane. A special arrangement of gearing for tipping, opening and closing the bucket on the crane by the attendant is provided, together with a safety device for insuring that the crane is held on the rails should an extra strain be placed on the jib.

For storing coke in the yard, as well as filling hoppers, the telpher track has quite recently been introduced into gas works by Messrs. Strachan and Henshaw, of Bristol. An installation of this description at the Keighley gas works has just been erected. It consists of 820 feet of telpher track on the above firm's single track, mono-rail principle, a section of which is shown in Fig. 18, and is made up of a

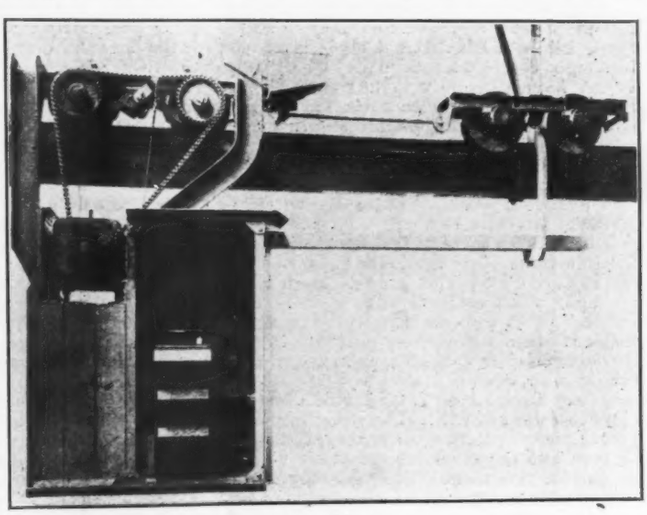


Fig. 18.

12-inch by 6-inch rolled, steel joist, mounted on which is a small renewable track, 3 inches high, fastened by hook bolts. This is the actual running rail for the telpher travelling wheels. In the retort house a line of telpher track 18 feet 6 inches above the charging floor is installed along the whole length of the benches and the center of which is 5 feet 6 inches from the retort face. Outside the retort house the track is 35 feet above the ground, the level of which is considerably lower than the retort house floor. The track leaves the retort

house, in a straight run of 116 feet, at an inclination of 1 in 30 to carry it over the hoppers, then curves with a radius of 40 feet over the coke storage ground and returns almost parallel with the hoppers. The track joist is supported by lattice-legged trestles and where over the hoppers these trestles also support the hoppers (Fig. 19).

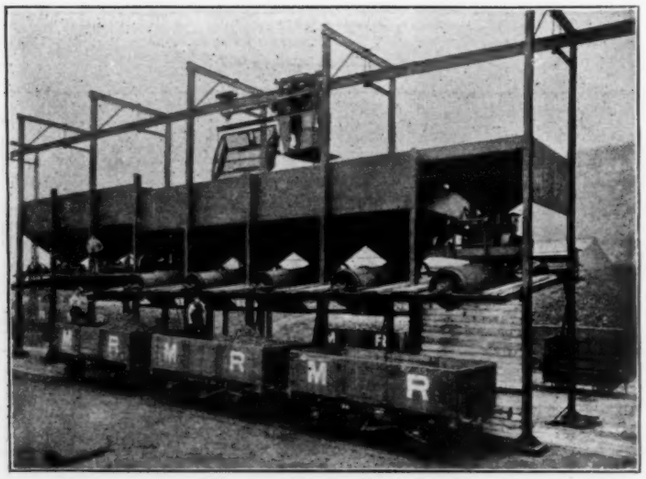


Fig. 19.

The trolley wire for carrying the current is supported on the trestle arms by insulators and the earth return is through the track.

The electric telpher has two motors, one for travelling and one for hoisting. The hoisting motor operates the hoisting drum through double reduction spur gear and an electric brake is provided which automatically holds the load immediately the current is cut off. The telpher is capable of handling 30 cwts. gross load at a maximum hoisting speed of 60 feet per minute and a maximum travelling speed of 500 feet per minute. Both motors are controlled by a single crane type controller which, by a change-over switch, may operate either motor.

The skips which receive the hot coke are made with Belton's expanding lattices and are hoisted by the telpher and carried to a steel water tank outside the retort house into which they are immersed for quenching the coke. A skip will receive the contents of three retorts and the telpher deposits the empty skips right up alongside the retorts. After quenching, the skip is hoisted out of the tank and carried by the telpher to the hoppers or storage yard as required. The skips are fitted with lifting trunnions, the ends of which are attached to the lifting hooks of the telpher, and are self-tipping when full, and self-righting when empty. At the end of each skip is a tipping catch which holds it in position and which may be released from the driver's cabin by a cord passing over pulleys and kept tight by a balance weight. The load can thus be tipped at any height from the ground, and when discharging on the heap can be lowered close down to avoid breakage of coke and accumulation of breeze. The screening plant was designed and manufactured by Messrs. Dempster & Sons, Limited, Elland, and consists of continuous hoppers divided into eight compartments into which the telpher delivers the coke, and which have a capacity of 80 tons. The first compartment from the retort house is fitted with a coke breaker beneath, the supply to which is regulated by an adjustable sliding tray feed, and the breaker has adjustable rollers to give sizes according to requirements. From the breaker the coke passes to a revolving screen with $\frac{5}{8}$-inch and $1\frac{1}{4}$-inch holes, thus giving three sizes—breeze, small screened and trailings. The next four compartments are without breaker and deliver on to revolving screens with $\frac{1}{2}$-inch holes, thus extracting breeze only. The supply to these is controlled by spiral feeds on the screen shaft working in a trough fastened to the hopper bottom in order to prevent a sudden rush of coke to the screen. Each screen has a capacity of 5 tons per hour when rotating at 20 r.p.m. The screened coke may be delivered direct into carts or railway wagons. The remaining three hopper compartments are provided each with a jigging or shaking screen strung by forged hangers from above and driven by a forged crank shaft giving a 5-inch stroke to the screen at 100 strokes per minute. Each screen is driven off a fast and loose pulley so that each can be stopped at will. The screening plant is driven by two 8-horse power Siemens motors, so arranged that one motor drives the jigging screens and the other the revolving screens and breaker, but should one motor give trouble the other may be geared to drive both sections.

The generating plant for the telpher and screens consists of a $33\frac{1}{2}$ B.H.P. National gas engine, with self-starter, coupled to a Siemens compound-wound, 220-volt generator, giving an output of 19.5 kw. running at 250 r.p.m. The switchboard has 3 panels—generator, telpher feeder and screen feeder panel. The generator panel has a change-over switch for connecting up the generator serving current to the stoking machinery. Thus in case of breakdown to either generator the main current may be transferred from one to the other as desired.

From the above survey of apparatus for the mechanical handling of coal and coke in British gas works it will be seen that very great advances have been made in the development of appliances that not only increase output and economy, but also go a long distance towards the elimination of those labor troubles which are the bane of the industrial world. It is hoped, therefore, that this description of modern practice will not be without interest to American gas engineers.

Items of Interest
FROM VARIOUS LOCALITIES.

"R. W. P." forwards the following from St. Louis, Mo., under recent date: "The election of a successor to Mr Jas. I. Beggs, as President of the Laclede Gas Light Company, of this city, who, as your readers generally know, resigned that post several months ago, was set for the 13th inst. The selection was postponed, chiefly for the reason that Mr. W. K. Bixby, who was elected member of the Board of Directors, refused to accept the position. Membership on the Board has increased to 14—4 was the prior number—whose names are as follows: W. A. Bixby, Wm. Potter, Adolphus Busch and G. H. Walker."

THE Chattanooga (Tenn.) Gas Company has agreed to make the necessary main extensions for the supply of gas to and through the streets of Ridgedale. This means the placing of 3 miles of pipe.

THE proprietors of the Grand Junction (Col.) Gas Company have authorized an expenditure not far from $30,000, which means that the complete working outfit will be doubled. The announcement looks rather odd, for the Company certainly doubled the generating capacity of its plant late in 1908. However, our information comes from an entirely reliable source.

MR. F. C. ALBEE informs us that the Champion Steel Range Company's type of "Champion Interchangeable Gas and Coal Range" was given the highest award (that of a gold medal) by the jurors of award who sat in connection with the matter of judging the exhibits made at the recent Alaska-Yukon-Pacific Exposition.

MESSRS. G. V. REYNOLDS, James O. Rodgers and Geo. E. Nicholson have applied to the city of St. Louis for the right to there distribute natural gas. In responding to some remarks made over the matter the counsel of the proposed supporters declared that the time for granting St. Louis cheap gas was at hand. The measure asking for permission, however, has enough in its verbiage to show that the whole thing is a case of "playing safe," for the "enterprising capitalists" back of the concern pledge themselves that, in case the supply of natural gas should fail, they stand ready to construct a works up to manufacturing any desired quantity of artificial gas, to be furnished at a rate not to exceed 60 cents per 1,000 cubic feet. The Council of Public Improvements Committee seems also to be very naturally interested in the project."

MR. GEORGE W. WHITE, of the firm of Messrs. R. D. Wood & Co., whose clever contribution to our semi-centennial symposium on "Advances in the Manufacture of Cast Iron Pipe" has been complimented by many, has been nominated by the Republicans of the Camden (N. J.) district as their candidate to represent them in the State Assembly. If he is as popular in the voting booths of that section as he is on the staff of the big concern with which he is affiliated in business, there will be no one else in the voting.

THE death of Mrs. Alexander Largue, whose demise occurred at her home in St. Louis, Mo., some days ago, recalls the fact that her husband was one of those who were concerned in the incorporation of the old, or original, St. Louis Gas Light Company. She was in her 77th year, having been born in Pittsburgh, Pa., August 2, 1833.

MR. F. A. ROSCH, who for 12 years has been with the Portland (Ore.) Gas Company, has lately opened a place of business in the premises, 143 Seventh street, Portland, Ore., under the name of the Portland Gas Appliance Company. The Portland Gas Company has discontinued the sale of such appliances and is now confining itself strictly to the distribution of gas only. Mr. Rosch saw a good opportunity to take up some of the lines formerly handled by the Gas Company. We certainly wish him all possible success in his new venture. And he surely should make a brisk go of it, for he was a popular chap with the customers of the Portland gas concern.

CONTROL of the Salem (Mass.) Electric Company has been secured by Mr. C. H. Tenney. It is positively stated that neither the Edison Electric Company, of Boston, nor the gas interests of Salem, are in any way interested in the transfer, the purchase having been solely made for investment on Tenney syndicate account.

A CORRESPONDENT in Boston, Mass., under date of the 15th inst., forwards the following: At the annual meeting of the Edison Company, of Boston, held earlier this week, the retiring Directors were re-elected, and the shareholders instructed the President to petition the Board of Gas and Electric Light Commissioners for authority to increase the capital stock, by emitting not over 20,000 shares from the present 131,161 shares to take up notes issued for new properties acquired last month at a cost of about $2,870,000; also, notes issued from time-to-time to take care of the normal growth of the Company's business, amounting to almost $1,000,000. A petition will be filed with the Massachusetts Board of Commissioners for authority to issue the new shares to stockholders at a price to be determined by the Directors, subject to approval of the Commission. The last increase in the capital of the Company was made in December, 1908, when 9,725 shares of new stock were offered stockholders at $215 a share, on the basis of one new share for each 13 shares outstanding. The 24th Annual Report of the Edison Electric Illuminating Company, of Boston, for the fiscal year ended June 30, 1909, compares as follows:

	1909.	1908.	1907.
Gross	$4,111,343	$4,229,239	$4,020,621
Expenses	2,274,956	2,261,344	2,116,179
Net	$1,836,387	$1,967,895	$1,904,442
Other income	45,360	38,441	41,340
Total net	$1,881,747	$2,006,336	$1,945,782
Taxes	426,542	397,585	453,479
Balance	$1,419,206	$1,608,751	$1,492,303
Interest and dividends	1,511,235	1,445,784	1,406,701
Surplus	*$92,029	$162,967	$85,602

*Deficit.

The number of lamps and motors connected compare as follows:

	1909.	19 8.	1907.
Incandescent	1,040,613	938,670	863,313
Arc	9,282	9,867	10,339
Motors (horse power)	44,066	39,422	35,095

Charles L. Edgar, President, says: "The increase in connected load has again surpassed any previous record, being far in excess of any former year. This has been brought about largely because of the reduction in price made on July 1, 1908. The earnings, however, during the past year felt the bad effects of the depression more than they have the good effects of the reduction in price. No further installations have been made or contracted for at the L Street Station, with the exception that the first two turbines, installed some 4 or 5 years ago, have been very materially increased in capacity at a somewhat nominal expense, as the result of improvements which have been made by the manufacturers. The capacity of this station is now 80,000-horse power instead of 68,000 as before. During the latter part of the year agreements were made, subject to the approval of of the Board of Gas and Electric Light Commissioners, to purchase the electric properties in all the towns and cities named, viz.: Newton, Chelsea, Watertown, Brookline, Brighton and Waltham, and to dispose of whatever interest your Company had in the gas properties located in Newton, Chelsea and Watertown. The necessary permission of the Gas Commission was obtained, and since the close of the fiscal year these properties have been acquired and possession was taken on September 1, 1909. These purchases have been financed temporarily by notes, and it is intended to ask you at the annual meeting to authorize the proper officers of the Company to take the preliminary steps toward increasing the capital stock by an amount which will provide sufficient funds not only to take up the notes issued for the purchase of those properties, but also those issued from time-to-time to take care of the normal growth of the Company since the last increase in capital stock."

THE Public Service Commission for the Second New York District has assented to the proposal for the merging of the Nassau Light and Power Company, the Nassau Gas, Heat and Power Company, the Floral Park Light and Power Company, and the Oyster Bay Electric Light and Power Company, all of which corporations are actively engaged in business in Nassau county, Long Island.

BEGINNING to-day the Public Service Commission, Second New York District, will take evidence respecting the complaint of the Mayor of Little Falls that the prices charged by the Utica Gas and Electric Company in Little Falls, both on gas and electric account are exorbitant and unreasonable.

MR. W. D. ALLEN, proprietor of the Farmington (N. H.) Gas Company, has notified the residents that no gas will be manufactured in that settlement after the 1st prox.

ADVICES from Galveston, Tex., are to the effect that early this month a shipment of 1,000 tons of anthracite coal, billed to the San Antonia Gas Company, was made from Galveston over the Aransas Pass railroad. The initial shipping point was Philadelphia by schooner. It took 50 cars to hold the quantity.

MR. FREEMAN FIELD, Vice-President and Treasurer of the Springfield Gas Power Company, Kansas City, Mo., informs us that the Company purchased the entire plant and possessions of the Weber Gas Engine Company, at the recent sale in bankruptcy thereof. The new President of the concern is Mr. George M. Hawes, a graduate of the Massachusetts Institute of Technology, and a man in every sense qualified to fill the stated position. He is both theoretical and practical along lines of machinery in general and of gas engines and producer works as well; and to his engineering skill he then oddly adds a more than the average share of that knowledge which enables an engineer to get on in commercial circles. The Vice-President and Treasurer of the Company (Mr. Freeman Field), however, is its expert business man. Not only can he direct the making of an engine, but after it is made he can go on the road and sell it, or go on with the field force and erect it. Since 1902 he has been connected with the Olds Gas Power Company as its General Sales Manager and Western Agent. The Assistant Manager of the Company (Mr. W. H. Spiller) is also a college man—we are not sure whether he carries the Harvard or Brown seal—and his practical knowledge of power and its applications, no matter what the source of energy may be, entitles him to the say that his course with the rejuvenated Weber concern will be creditable to himself and valuable to his co-workers.

THE Domestic Producer Gas Company, of Bloomington, Ills, has been incorporated by Messrs. Sherman Davis, J. W. O'Harrow and G. B. Loxley. It it capitalized in $10,000—as a starter.

AT the annual meeting of the Evansville (Ind.) Gas and Electric Light Company the officers elected were: President, H. D. Walbridge; Vice-President, E. G. Schmidt; Secretary, S. J. Haas; General Manager, A. C. Blinn. Superintendent Contract Department, Mr. E. C, Pullen, of Chicago, who succeeds Mr. A. P. Tills. Mr. Blinn, who succeeds Mr. W. B. McDonald, assumes his new duties on the 1st prox., his resignation as Superintendent of the Macon (Ga.) Gas Light Company having been accepted by that Company. The Board voted to expend $75,000 in extensions and new equipments for the electric plant, the proposed assembling including an additional 2,500-horse power horizontal turbine. Vice-President Haas is certainly in the saddle at Evansville, and as is usual with him wherever he has been, he manages to get his men together at the outset.

UNDER the terms of the profit sharing plan adopted by the New Haven (Conn.) Gas Company 2 years ago, on the 13th inst. 72 shares of bonus stock was distributed amongst 72 men. At the moment, and under this plan, 216 men have been awarded 529 shares.

"PROFESSOR" WILLIAM DENNIS MARKS has secured another "experting" job in the gas line. This time he serves Mayor James C. Haynes, of Minneapolis, Minn., who is doing his best to prove that the property of the Minneapolis Gas Light Company is not worth that which its owners paid for it, so that the city may take it over at figures adjudged right and proper by Haynes-Marks-etc. The beautiful faith that Haynes has in "Dennis" is thus expressed in an interview had between the former and a reporter of the Minneapolis *Journal*: "I think Prof. Marks will not be a partisan expert, but one in whom the Company can have as much faith as the city." We believe what we can; and, we can what we can't! We also understand that the other shade or shadow of "Dennis," Dr. Bemis, is to have a hook in on the expert fees that are to be given up at the instance of Mayor Haynes—at least so we are told. There is another laborer who is always looking for hire. Think of it. Marks and Bemis as valuators of gas properties!

PRESS despatches are to the effect that at a meeting held a few days ago by the Japan-Corea Gas Company, it was decided that the Company should purchase all the property of the American-Corean Tramway and Electric Lighting Company, of Seoul, and that the Japanese Company should be renamed The Japan-Corea Gas and Electric Company. The President reported that the price of the foreclosure of the American Company was $875,000.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHARLES H. WADELTON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.
Telephone, 2996 John.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance, Single copies, 10 cents.

The JOURNAL is the official organ of the NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

AGENTS:

New York—American News Company, 39 and 41 Chambers street.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime street, London.

MONDAY, OCTOBER 25, 1909.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

OCTOBER 25.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$73,177,000	100	143¾	144¼
Central Union Gas Co. — 1st 5's, due 1972, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.— Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	2,500,000	100	155	165
New Amsterdam Gas Co.— 1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	100	101
New York and East River— 1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union— 1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	143¾	145
1st Con. 5's, due 1948, M. & N.	15,000,000	—	91¾	92
Yonkers	299,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	1	1½
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	90	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	73	73½
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	92	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt & Heating Co.	1,682,750	100	90¼	91
Preferred	3,028,500	100	75¼	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	458,000	—	102	105
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100½
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	108	108½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis	10,000,000	100	104	105
Preferred	2,500,000	100	—	98
Bonds	10,000,000	1,000	104	—
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co. " 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	69½	70
Preferred	25,000,000	100	95	95½
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	115½	115½
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104½	105½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.— 1st Mtg. 5's	751,000	1,000	100	102
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	90	95
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	100	104
Washington (D. C.) Gas Co.	3,600,000	20	352½	357½
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	230	—

Advertisers' Index.

New advertising, or changes in standing ads., to assure attention the issue following their reception, must be in hand on Wednesday.

GAS ENGINEERS.

Albert Ladd Colby, South Bethlehem, Pa. 970
Bartlett-Hayward Co., Baltimore, Md. 993
Chamber Oven Co., Milwaukee, Wis. 975
Cruse-Kemper Co., Philadelphia, Pa. 980
Davis & Farnum Mfg. Co., Waltham, Mass. 992
Economical Gas Apparatus Construc. Co., Toronto, Ont. 970
Evens & Howard Firebrick Co., St. Louis, Mo. 982
Frank D. Moses, Trenton, N. J. 974
Frederick J. Mayer, New York City 973
Henry L. Lea, Chicago, Ills. 982
H. M. Byllesby & Co., Chicago, Ills. 982
Humphreys & Glasgow, New York City 982
Improved Equipment Company, New York City 974
Isbell-Porter Co., Newark, N. J. 980
Kerr Murray Mfg. Co., Fort Wayne, Ind. 993
Laclede-Christy Clay Products Co., St. Louis, Mo. 988
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 982
Quintard Iron Works, New York City 981
R. D. Wood & Co., Philadelphia, Pa. 994
The Gas Machinery Co., Cleveland, O. 972
The Stacey Mfg. Co., Cincinnati, O. 995
The United Gas Improvement Co., Philadelphia, Pa. 987
Western Gas Construction Co., Fort Wayne, Ind. 1000
William A. Baehr, Chicago, Ills. 970

GAS WORKS APPARATUS AND CONSTRUCTION.

Bartlett-Hayward Co., Baltimore, Md. 993
Chamber Oven Co., Milwaukee, Wis. 975
Connelly Iron Sponge & Governor Co., New York City. 989
Continental Iron Works, Brooklyn, N. Y. 990
Cruse-Kemper Co., Philadelphia, Pa. 980
Davis & Farnum Mfg. Co., Waltham, Mass. 992
Deily & Fowler Mfg. Co., Philadelphia, Pa. 993
Economical Gas Apparatus Construc. Co., Toronto, Ont. 970
Evens & Howard Firebrick Co., St. Louis, Mo. 972
Gas Engineering Co., Trenton, N. J. 974
Humphreys & Glasgow, New York City 982
Improved Equipment Company, New York City 974
Isbell-Porter Co., New York City 980
Kerr Murray Mfg. Co., Fort Wayne, Ind. 993
Laclede-Christy Clay Products Co., St. Louis, Mo. 988
Lloyd Construction Co., Detroit, Mich. 970
Quintard Iron Works Co., New York City 981
R. D. Wood & Co., Philadelphia, Pa. 994
Riter-Conley Mfg. Co., Pittsburgh, Pa. 979
The Gas Machinery Co., Cleveland, O. 972
The Stacey Mfg. Co., Cincinnati, O. 995
The United Gas Improvement Co., Philadelphia, Pa. 987
Western Gas Construction Co., Fort Wayne, Ind. 1000

PROCESSES.

Bartlett-Hayward Co., Baltimore, Md. 993
Chamber Oven Co., Milwaukee, Wis. 975
Economical Gas Apparatus Construc. Co., Toronto, Ont. 970
Humphreys & Glasgow, New York City. 982
Improved Equipment Company, New York City 974
The Gas Machinery Co., Cleveland, O. 972
The United Gas Improvement Co., Philadelphia, Pa. 987
Western Gas Construction Co., Fort Wayne, Ind. 1000

SCRUBBERS AND CONDENSERS.

Bartlett-Hayward Co., Baltimore, Md. 993
Chamber Oven Co., Milwaukee, Wis. 975
Continental Iron Works, Brooklyn, N. Y. 990
Cruse-Kemper Co., Philadelphia, Pa. 980
Davis & Farnum Mfg. Co., Waltham, Mass. 992
Economical Gas Apparatus Construc. Co. Toronto, Ont. 970
Evens & Howard Firebrick Co., St. Louis, Mo. 982
Isbell-Porter Co., Newark, N. J. 980
Kerr Murray Mfg. Co., Fort Wayne, Ind. 993
Quintard Iron Works, New York City. 981
R. D. Wood & Co., Philadelphia, Pa. 994
Riter-Conley Mfg. Co., Pittsburgh, Pa. 979
The Gas Machinery Co., Cleveland, O. 480
The Stacey Mfg. Co., Cincinnati, O. 995
The United Gas Improvement Co., Philadelphia, Pa. 987
Western Gas Construction Co., Fort Wayne, Ind. 1000

PRODUCER POWER PLANTS.

Economical Gas Apparatus Construc. Co., Toronto, Ont. 970
R. D. Wood & Co., Philadelphia, Pa. 994

TAR AND CARBONIC ACID EXTRACTOR.

Bartlett-Hayward Co., Baltimore, Md. 993
Chamber Oven Co., Milwaukee, Wis. 975
Economical Gas Apparatus Construc. Co., Toronto, Ont. 970
Isbell-Porter Co., Newark, N. J. 980
Kerr Murray Mfg. Co., Fort Wayne, Ind. 993
The Gas Machinery Co., Cleveland, O. 972
The Stacey Mfg. Co., Cincinnati, O. 995
The United Gas Improvement Co., Philadelphia, Pa. 987
Western Gas Construction Co., Fort Wayne, Ind. 1000

AMMONIA CONCENTRATORS.

Bartlett-Hayward Co., Baltimore, Md. 993
Chamber Oven Co., Milwaukee, Wis. 975
Michigan Ammonia Works, Detroit, Mich. 970
The Gas Machinery Co., Cleveland, O. 972
Western Gas Construction Co., Fort Wayne, Ind. 1000

GAS METERS.

American Meter Co., New York and Philadelphia. 999
D. McDonald & Co., Albany, N. Y. 997
Helme & McIlhenny, Philadelphia, Pa. 999
John J. Griffin & Co., Philadelphia, Pa. 952
Keystone Meter Co., Royersford, Pa. 998
Maryland Meter and Mfg. Co., Baltimore, Md. 998
Metric Metal Co., Erie, Pa. 999
Nathaniel Tufts Meter Co., Boston, Mass. 998
New York Improved Meter Co., New York City. 998
Pittsburg Meter Co., East Pittsburg, Pa. 978
Rotary Meter Co., New York City. 971
Sprague Meter Co., Bridgeport, Conn. 997

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia. 999
D. McDonald & Co., Albany, N. Y. 997
Helme & McIlhenny, Philadelphia, Pa. 999
John J. Griffin & Co., Philadelphia, Pa. 952
Keystone Meter Co., Royersford, Pa. 998
Nathaniel Tufts Meter Co., Boston, Mass. 998
New York Improved Meter Co. New York City. 998
Pittsburg Meter Co., East Pittsburg, Pa. 988
Sprague Meter Co., Bridgeport, Conn. 997

PREPAYMENT METER ATTACHMENTS.

New York Improved Meter Co., New York City..... 998

WATER METERS.

Pittsburg Meter Co., East Pittsburg, Pa..... 978

GAS AND WATER PIPES.

Davis & Farnum Mfg. Co., Waltham, Mass..... 992
Donaldson Iron Co., Emaus, Pa..... 984
Economical Gas Apparatus Construc. Co., Toronto, Ont. 970
R. D. Wood & Co., Philadelphia, Pa..... 994

GAS COALS.

Berwind-White Coal Mining Co., New York and Phila. 980
Perkins Co., New York City..... 990
Westmoreland Gas Coal Co., Philadelphia, Pa..... 991

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., New York City..... 994

MAIN AND SERVICE LAYING.

Sullivan Bros., Flushing, N. Y..... 991

GAS TAPPING MACHINES.

George Light, Dayton, O..... 991
H. Mueller Manufacturing Co., Decatur, Ills..... 974

CANNEL COALS.

Perkins & Co., New York City..... 990

STOKING MACHINERY.

Chamber Oven Co., Milwaukee, Wis..... 975
G. A. Bronder, New York City..... 989
Laclede-Christy Clay Products Co., St. Louis, Mo..... 988
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 982

CONVEYORS—ALL KINDS.

Bartlett-Hayward Co., Baltimore, Md..... 993
Chamber Oven Co., Milwaukee, Wis..... 975
Cruse-Kemper Co., Philadelphia, Pa..... 980
C. W. Hunt Company, New York City..... 992
Economical Gas Apparatus Construc. Co., Toronto, Ont. 970
G. A. Bronder, New York City..... 979
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 993
The Gas Machinery Co., Cleveland, O..... 972
The Stacey Mfg. Co., Cincinnati, O..... 995
Western Gas Construction Co., Fort Wayne, Ind.....1000

CHARGING BARROWS & COAL WAGONS.

Davis & Farnum Mfg. Co., Waltham, Mass..... 992
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 993
The Stacey Mfg. Co., Cincinnati, O..... 995

GAS ENRICHERS.

Standard Oil Co., New York City..... 991

COKE CRUSHERS.

Bartlett-Hayward Co., Baltimore, Md..... 993
C. M. Keller, Columbus, Ind..... 991

GAS METER CONNECTIONS.

H. Mueller Manufacturing Co., Decatur, Ills..... 975

GAS COCKS.

H. Mueller Manufacturing Co., Decatur, Ills..... 975

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 984

GAS GOVERNORS.

Chaplin-Fulton Mfg. Co., Pittsburg, Pa..... 990
Connelly Iron Sponge & Governor Co., New York City. 989
Evens & Howard Firebrick Co., St. Louis, Mo..... 982
Isbell-Porter Co., Newark, N. J..... 980
Pittsburg Meter Co., East Pittsburg, Pa..... 978
Reynolds Gas Regulator Co., Anderson, Ind..... 989

CEMENTS.

C. L. Gerould, New Castle, Pa..... 988
Laclede-Christy Clay Products Co., St. Louis, Mo..... 988
Strassburger Bros., Chicago, Ills..... 988

RETORTS AND FIREBRICKS.

Baltimore Retort and Firebrick Co., Baltimore, Md... 988
Chamber Oven Co., Milwaukee, Wis..... 975
Didier-March Co., New York City..... 973
Evens & Howard Firebrick Co., St. Louis, Mo..... 982
Gas Bench Construction Co., St. Louis, Mo..... 981
Henry Maurer & Son, New York City..... 981
Improved Equipment Company, New York City..... 974
James Gardner, Jr., Co., Bolivar, Pa..... 990
J. H. Gautier & Co., Jersey City, N. J..... 988
Laclede-Christy Clay Products Co., St. Louis, Mo..... 988
Missouri Firebrick Co., St. Louis, Mo..... 988
Parker-Russell Mining and Mfg. Co., St. Louis, Mo.... 982

INCLINED RETORTS.

Baltimore Retort and Firebrick Co., Baltimore, Md... 988
Chamber Oven Co., Milwaukee, Wis..... 975
Didier-March Co., New York City..... 973
Evens & Howard Firebrick Co., St. Louis, Mo..... 982
Gas Bench Construction Co., St. Louis, Mo..... 981
Improved Equipment Company, New York City..... 974
Laclede-Christy Clay Products Co., St. Louis, Mo..... 988
Parker-Russell Mining and Mfg. Co., St. Louis, Mo... 982

VERTICAL S'S.

Chamber Oven Co., Milwaukee, Wis..... 975
Connelly Iron Sponge & Gov. Co. (Drake's [Eng.] System) 989
Didier-March Co., New York City..... 973
Evens & Howard Firebrick Co , St. Louis, Mo..... 982
Gas Bench Construction Co., St. Louis, Mo..... 981
Improved Equipment Company, New York City..... 974
Laclede-Christy Clay Products Co., St. Louis, Mo..... 988
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. .. 982

REGENERATIVE FURNACES.

Baltimore Retort and Firebrick Co., Baltimore, Md.. 988
Chamber Oven Co., Milwaukee, Wis..... 975
Bartlett, Hayward & Co., Baltimore, Md..... 993
Didier-March Co., New York City..... 973
Evens & Howard Firebrick Co., St. Louis, Mo..... 982
Gas Bench Construction Co., St. Louis, Mo..... 981
Improved Equipment Company, New York City..... 974
J. H. Gautier & Co., Jersey City, N. J..... 988
Laclede-Christy Clay Products Co., St. Louis, Mo..... 988
Missouri Firebrick Co., St. Louis, Mo..... 988
Parker-Russell Mining and Mfg. Co., St. Louis, Mo... 982

SELF-SEALING MOUTHPIECE DOORS.

Bartlett-Hayward Co., Baltimore, Md..... 993
Chamber Oven Co., Milwaukee, Wis..... 975
Continental Iron Works, Brooklyn, N. Y..... 994
Davis & Farnum Mfg. Co., Waltham, Mass..... 992
Isbell-Porter Co., Newark, N. J..... 980
Improved Equipment Company, New York City..... 974
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 993
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 982
Quintard Iron Works, New York City..... 981
R. D. Wood & Co., Philadelphia, Pa..... 994
The Gas Machinery Co., Cleveland, O..... 972
The Stacey Mfg. Co., Cincinnati, O..... 995
Western Gas Construction Co., Fort Wayne, Ind.....1000

INCANDESCENT GAS LAMPS.

General Gas Light Co., Kalamazoo, Mich..... 977
Welsbach Company, Gloucester, N. J..... 986

BURNERS.

Wm. M. Crane Co., New York City..... 984

STREET LAMPS.

Thos. T. W. Miner, New York City..... 970
Welsbach Street Lighting Co., New York and Phila.. 986

GAS BLAST FURNACES.

American Gas Furnace Co., New York City..... 976

PURIFIERS.

Bartlett-Hayward & Co., Baltimore, Md..... 993
Connelly Iron Sponge & Governor Co., New York City. 989
Cruse-Kemper Co., Philadelphia, Pa..... 980
Davis & Farnum Mfg. Co.. Waltham, Mass..... 992
Evens & Howard Firebrick Co., St. Louis, Mo..... 982
Isbell-Porter Co., Newark, N. J..... 980
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 993
Quintard Iron Works, New York City..... 981
R. D. Wood & Co., Philadelphia, Pa..... 994
The Stacey Mfg. Co., Cincinnati, O 995
The United Gas Improvement Co., Philadelphia, Pa... 987
Western Gas Construction Co., Fort Wayne, Ind.....1000

VALVES.

Bartlett-Hayward & Co., Baltimore, Md..... 993
Continental Iron Works, Brookln, N. Y..... 990
Davis & Farnum Mfg. Co., Waltham, Mass..... 992
Economical Gas Apparatus Construc. Co., Toronto, Ont. 970
Isbell-Porter Co., Newark, N. J..... 980
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 993
Ludlow Valve Manufacturing Co., Troy, N. Y..... 981
R. D. Wood & Co., Philadelphia, Pa..... 994
The Gas Machinery Co., Cleveland, O..... 972
The P. H. & F. M. Roots Co., Connersville, Ind..... 993
The Stacey Mfg. Co., Cincinnati, O..... 995
Western Gas Construction Co., Fort Wayne, Ind.....1000

(Continued on page 970.)

Position Wanted.

An American man, 43 years of age, with 22 years' experience in all branches coal gas business, would like to take charge of any department in large gas company, or as superintendent small gas company. Mains a specialty. South or West preferred. Address, "G. G.,"
1794-1 Care this Journal.

Position Wanted

By young married man, experienced in operating, accounting, purchasing and contracting ends of the gas, electric light and street railway business, so can fill almost any vacancy. Present salary $1,800.

Address, "L. L.,"
1794-1 Care this Journal.

WANTED,

A Working Foreman for Gas Plant,

who can run the water gas plant two or three hours each day and look after the balance of the plant, which consists of two benches of 6's besides the water gas set. Must be old enough to know the business. Good place for the right man. State salary expected.

Address, CHICKASHA GAS AND ELECTRIC CO.,
1794-1 Chickasha, Okla.

Wanted at Once,

Gas Works Engineer with Good Commercial Training,

To undertake the management of a new fuel and gas project. Offices in New York. Reply, giving references and salary expected for half his time and for full time. Only parties of experience need apply. Good opening for right man. Address, "NO. 447,"
1793-2 Care this Journal.

WANTED,

Water Gas Operator for Small Western Plant.

One who can make repairs to apparatus and also do pipe fitting. Wages, $75 per month. Address, stating experience and qualifications,

1793-2 "OPPORTUNITY," care this Journal.

WANTED,

Retort House Foreman for Coal Gas Plant.

Applicant must be fully capable of operating plant sending out 35,000,000 cubic feet.

Address, "RETORT,"
1794-2 Care this Journal.

WANTED,

Either an experienced salesman or a man of good address who is familiar with the design, construction and operation of coal gas benches, to travel for first-class bench builders. State age, experience and salary expected. Address, "X. Y. Z.,"
1791-tf Care this Journal.

WANTED,

A Man who is Capable of Taking Full Charge of a Gas and Electric Plant

In a small town in New York State, making water gas. Must understand the manufacture and distribution of gas and electricity thoroughly. State qualifications and salary expected. Address, "W. C.," care this Journal.
1791-4

WANTED,

To Purchase the Controlling Interest in a Gas Plant of Medium Size Town.

Give full particulars. Address,
1794-1 "J. & B.," care this Journal.

FOR SALE,

One Set of "King's Treatise on Coal Gas."

Three volumes. Edition 1882. Price, $100.

Address,
AMERICAN GAS LIGHT JOURNAL,
42 PINE STREET, NEW YORK CITY.

FOR SALE,

One set of 4 purifying boxes 12 feet 8 inches by 10 feet 9 inches by 3 feet, in good condition, with centerseal and 10-inch connections. Also one American 8-foot station meter.

1771-tf YORK GAS CO., York, Pa.

FOR SALE,

118 Improved Lamp Frames, Burners, Globes, Domes, Tops,

Used three years in city of Richmond, Ky., for gas street lighting. Model 18, made by the Cleveland Street Lighting Company, of Cleveland, O.

Address, B. R. DOHERTY,
1791-4 Supt. Richmond Water and Light Co.

(Concluded from page 969.)

PURIFYING MATERIALS.

Connelly Iron Sponge & Governor Co., New York City 989
F. Behrend, New York City 984
The United Gas Improvement Co., Philadelphia, Pa... 987

EXHAUSTERS.

Connelly Iron Sponge & Governor Co.,New York City 989
Connersville Blower Company, Connersville, Ind..... 996
Davis & Farnum Mfg. Co., Waltham, Mass..... 992
Isbell-Porter Company, Newark, N. J..... 980
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 993
Piqua Blower Co., Piqua, O..... 981
The P. H. & F. M. Roots Co., Connersville, Ind..... 983

HIGH PRESSURE GAS GOODS.

H. Mueller Manufacturing Co., Decatur, Ills..... 975

PURIFIER AND SCRUBBER TRAYS.

Bartlett-Hayward Co., Baltimore, Md..... 993
Cabot Mfg. Co., Hoboken, N. J..... 991
Western Gas Construction Co., Fort Wayne, Ind.....1000

PIPE LINE TOOLS.

H. Mueller Manufacturing Co., Decatur, Ills..... 975

GAS PLANT TOOLS.

H. Mueller Manufacturing Co., Decatur, Ills..... 975

GAS STOVES.

American Meter Co., New York and Philadelphia..... 985
Keystone Meter Co., Royersford, Pa..... 998
Maryland Meter & Manufacturing Co., Baltimore, Md.,. 998
Nathaniel Tufts Meter Co., Boston, Mass..... 998

HOT WATER HEATERS.

Humphrey Co., Kalamazoo, Mich..... 970

GASHOLDERS.

Bartlett-Hayward Co., Baltimore, Md..... 993
Continental Iron Works, Brooklyn, N. Y..... 990
Cruse-Kemper Co., Philadelphia, Pa..... 980
Davis & Farnum Mfg. Co., Waltham, Mass..... 992
Deily & Fowler Mfg. Co., Philadelphia, Pa..... 996
Economical Gas Apparatus Construc. Co., Toronto, Ont. 970
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 993
R. D. Wood & Co., Philadelphia, Pa..... 994
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 979
The Stacey Mfg. Co., Cincinnati, O..... 995
Western Gas Construction Co., Fort Wayne, Ind.....1000

STORAGE TANKS.

Bartlett-Hayward Co., Baltimore, Md..... 993
Davis & Farnum Mfg. Co., Waltham, Mass..... 992
Quintard Iron Works, New York City..... 981
The Stacey Mfg. Co., Cincinnati, O..... 995
Western Gas Construction Co., Fort Wayne, Ind.....1000

COKE OVEN ENGINEERS.

Albert Ladd Colby, South Bethlehem, Pa..... 970

PATENTS, TRADE-MARKS AND COPYRIGHTS.

Royal E. Burnham, Washington, D. C..... 991

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.
IMPROVED AMMONIA CONCENTRATOR.
About 100 in use. Write to
STROH & OSIUS, Patentees, or
MICHIGAN AMMONIA WORKS, - Detroit, Mich.

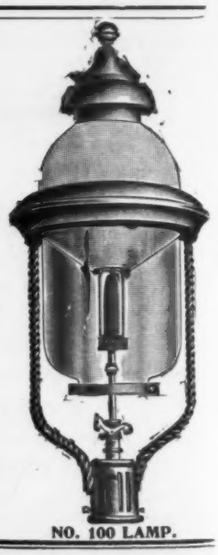
WILLIAM A. BAEHR,
CONSULTING ENGINEER,
Commercial National Bank Building,
CHICAGO.
Also Representing
The Bartlett-Hayward Company.

ALBERT LADD COLBY,
CONSULTING ENGINEER.
ECONOMIC COKING OF COAL.
ADVICE BASED ON THOROUGH STUDY OF AMERICAN AND EUROPEAN COKE OVENS.
Cable Address: "ALADDCO," So. Bethlehem, Pa.
All Usual Codes.

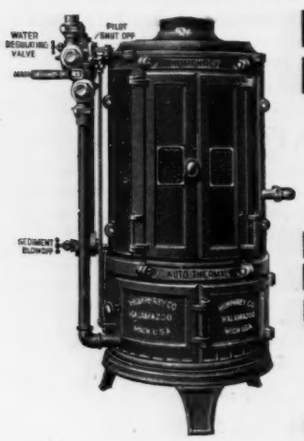
THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,
Consulting Engineers.
Builders of UP-TO-DATE Machinery and Appliances for Coal and Water Gas Plants. :: :: :: :: ::
PLANS, SPECIFICATIONS AND ESTIMATES PREPARED.
AMERICAN OFFICE:
269 Front St., East, Toronto, Canada.

LLOYD CONSTRUCTION COMPANY
GAS APPARATUS.
DETROIT - MICHIGAN

"THE MINER"
GLOBE STREET LAMPS.
OVER FORTY YEARS IN USE THE WORLD OVER.
THE BEST STREET LAMPS for ALL KINDS OF GAS OR BURNERS.
This is only one of a Large Variety of Styles.
SEND FOR CATALOGUE.
THOS. T. W. MINER,
821 and 823 Eagle Avenue, New York.

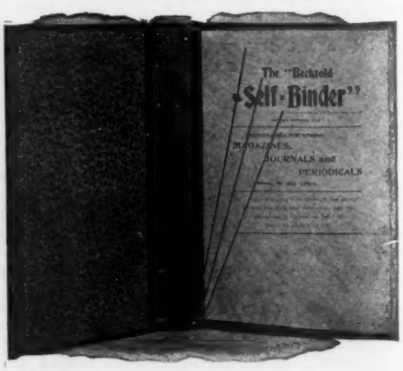


NO. 100 LAMP.



Humphrey Auto-Thermal Instantaneous Water Heaters
Have every known desirable feature helping to efficiency, economy, durability and absolute safety.
FULLY GUARANTEED.
PRICES LOW.
QUALITY AND SERVICE HIGH.
Will you help us sell them?
HUMPHREY CO.,
Kalamazoo, Mich., U. S. A.

BINDERS FOR THE JOURNAL.
PRICE, $1.
FOR SALE BY
AMERICAN GAS LIGHT JOURNAL 42 Pine St., New York City.



A "Car Load Lot" of Rotaries Containing

No. 8,	No. 10,	No. 7,	No. 4,
45,000 cu. ft. per hour.	100,000 cu. ft. per hour.	30,000 cu. ft. per hour.	7,500 cu. ft. per hour.

THIS "CAR LOAD LOT" REPRESENTS A MEASURING CAPACITY OF

4,380,000 cu. ft. per day.

Rotary Station Meters can be supplied for any capacity between 1,500 cu. ft. per hour and 250,000 or more, cu. ft. per hour.

ROTARY METER COMPANY

One-half the Cost—One-tenth the Space of Old Style Wet Meters.

WHEN IN NEED OF STATION METERS WRITE

ROTARY METER COMPANY,

280 BROADWAY,

NEW YORK.

Send for Catalog.

P. PLANTINGA, President W. E. STEINWEDELL, Secretary

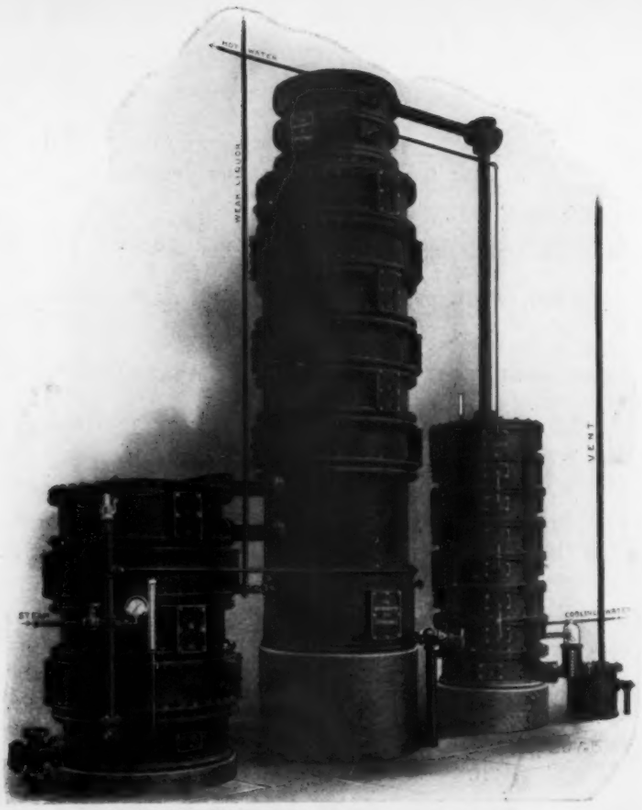
THE GAS MACHINERY CO.,

Main Office and Shops

CLEVELAND, OHIO.

NEW YORK OFFICE, - - 56 PINE STREET.

COAL AND WATER GAS APPARATUS,
EXHAUSTERS, CONDENSERS, SCRUBBERS,
TAR EXTRACTORS, WASHERS, PURIFIERS,
VALVES, CONNECTIONS,
BY PRODUCT MACHINERY,
COMPLETE GAS PLANTS.



FREE AND FIXED AMMONIA STILLS AND ABSORBER.

THE GAS MACHINERY CO.
CLEVELAND, OHIO.

DIDIER-MARCH COMPANY,

Hudson Terminal Building,

WORKS:
Keasbey, Perth Amboy, N. J.

50 Church Street,
NEW YORK, N. Y.

DESSAU SYSTEM OF VERTICAL RETORTS,

"The Only System in Successful Operation."

U. S. Patent No. 904043.
"Process Patent for the Carbonization of Coal in Vertical Retorts."

U. S. Patent No. 801268.
"Operating Mechanism for Bottom Mouthpieces."

U. S. Patent No. 906187.
"Feeding Device."

U. S. Patent No. 899503.
"Retort House."

U. S. Patent No. 915156.
"Recuperation."

388 Benches, with 3984 Retorts in operation and under construction.

TOTAL DAILY PRODUCING CAPACITY, 60,000,000 CUBIC FEET.

First Installation in the United States of America,

PROVIDENCE, R. I., 12 BENCHES, 120 RETORTS,

Complete, with

Retort House, Coal and Coke Handling Machinery and Storage Bins.

HORIZONTALS AND INCLINES OF APPROVED TYPES.

Correspondence Solicited.

FREDERICK J. MAYER, General Manager.

WE STOP CLINKERS.

RECENT INSTALLATIONS OF HALF DEPTH SIXES EQUIPPED WITH THE DOHERTY BENCH FUEL ECONOMIZER ARE OPERATING WITH 240 POUNDS OF BENCH FUEL PER TON OF COAL CARBONIZED, AND NO CLINKERS.

IF YOU CANNOT DO AS WELL YOU ARE LOSING GOOD MONEY!

—NEW BENCHES—REFILLINGS.—
HORIZONTALS—INCLINES—VERTICALS.

Sole Agents for Western States for the Dessau System of Vertical Retorts.

THE IMPROVED EQUIPMENT COMPANY,

MAIN OFFICES: 60 WALL STREET, NEW YORK, N. Y.

SOLE LICENSEES FOR THE DOHERTY BENCH FUEL ECONOMIZER.

LONG DISTANCE TELEPHONE, 1503-D.

FRANK D. MOSES, President.

GAS ENGINEERING CO.,

MANUFACTURERS AND ERECTORS OF

COMPLETE GAS WORKS.

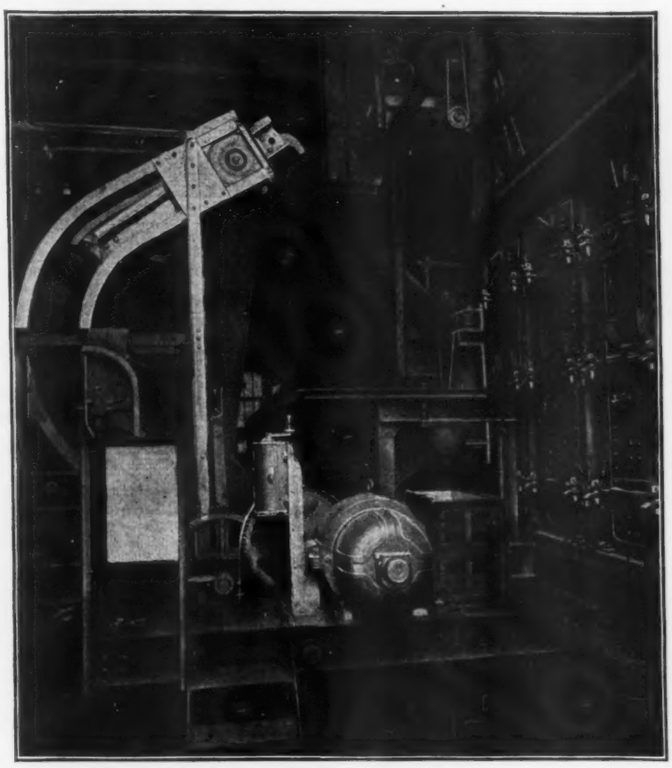
SPECIAL ATTENTION GIVEN TO LARGE PURIFIERS.

OFFICE AND WORKS, - - - - - - TRENTON, N. J.

CHAMBER OVENS.

Do You Know About Chamber Ovens?

Horizontal, Vertical, or Inclined.



If your output is over 250,000 feet per diem don't fail to consult

THE CHAMBER OVEN CO.,

405 Keene St.,

MILWAUKEE, WIS.

FRED. BREDEL, President.

WM. H. CAMPBELL, Eastern Agent,

Virginia State Insurance Building, Richmond, Va.

Horizontal Chamber Oven with four chambers. Capacity, 125,000 cubic feet per oven.

Mueller High Pressure Gas Service Sets.

The practical application of some of Mueller High Pressure Gas Goods is shown in these three illustrations of gas service sets.

Either of these arrangements at the main has proved highly satisfactory in service, the Mueller High Pressure Gas Goods used meeting every requirement.

All Mueller High Pressure Gas Goods are inspected, tested and Unconditionally Guaranteed.

Literature and detail information upon request.

TRADE MARK MUELLER REGISTERED

Set No. 1.

Set No. 2.

Set No. 3.

H. MUELLER MFG. CO.

Works and General Offices
DECATUR, ILL., U. S. A.
West Cerro Gordo St

Eastern Division,
NEW YORK, N. Y., U. S. A.
254 Canal St. (cor. Lafayette).

GAS BLAST FURNACES

—AND—

HEATING MACHINES

—FOR—

INDUSTRIAL PURPOSES.

STATE

AMOUNT . . . . . .
SIZE . . . . . OF
KIND . . . . . }

WORK TO BE DONE IN GIVEN TIME.

AMERICAN GAS FURNACE COMPANY,

24 JOHN STREET, · · · NEW YORK, N. Y.

CATALOGUE SENT ON APPLICATION.

SCIENTIFIC BOOKS.

GAS MANUFACTURE. By W. J. A. Butterfield. Vol. I., Material and Processes. $2.50. Vol. II., In Preparation.

MODERN GAS ENGINES AND PRODUCER GAS PLANTS. By R. E. Mathot. $2.50.

COAL TAR AND AMMONIA. By George Lunge. $15.

GAS ANALYSIS. By Dr. W. H. Birchmore. $1.25.

ELECTRIC GAS LIGHTING. By H. S. Norrie. 50 cents.

GAS ANALYST'S MANUAL. By J. Abady. $6.50.

GAS ENGINE DESIGN. By C. Edward Lucke, Ph.D. $3.

THE "GAS WORLD" YEAR BOOK, 1908. Edited by John Douglas. $3.

GAS AND GAS WORKS. By Hughes and O'Connor. $2.50

POOLE ON FUELS. By Herman Poole. $3.

GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor $3.50.

PRACTICAL TREATISE ON HEAT. By Thomas Box. 2d edition. $5.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

SELF-INSTRUCTION FOR STUDENTS IN GAS MANUFACTURE. Elementary, advanced and constructional, each, $1.50.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

GAS ENGINE. By F. R. Hutton, E.M., Ph.D., Sc.D. $5.

TECHNICAL GAS ANALYSIS. By Winkler & Lunge. $4.

CHEMISTRY OF GAS MANUFACTURE. By Harold M. Royle, F.C.S. $4.50.

HEMPEL'S GAS ANALYSIS. $2.25.

PRACTICAL TESTING OF GAS AND GAS METERS. By C. Stone. $3.50.

GAS ENGINE THEORY AND DESIGN. By A. C. Mehrtens, M E. $2.50.

HANDBOOK FOR GAS ENGINEERS AND MANAGERS. Seventh edition. By Thomas Newbigging. $6.50.

GAS, GASOLINE AND OIL ENGINES. By Gardner D. Hiscox. Fifteenth edition. $2.50.

PRACTICAL HANDBOOK ON GAS ENGINES. By G. Lieckfeld. $1.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2.

GASFITTERS' QUESTION BOOK, WITH ANSWERS. By Albert Dunbar, S.B. $1.60.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $1.50.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

FINANCES OF GAS, ELECTRIC LIGHT AND POWER ENTERPRISES. By Wm. D. Marks. $4.

STANDARD REDUCTION FACTORS FOR GASES. By Helon Brooks MacFarland. $1.50.

PRACTICAL PLUMBING. By P. J. Davies. Vol. I., $3. Vol. II., $4.50.

AMERICAN SANITARY PLUMBING. By James J. Lawler. $2.

HENLEY'S 20TH CENTURY BOOK OF RECIPES, FORMULAS AND PROCESSES. By Gardner D. Hiscox. $3.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5.

THE "GAS WORLD" ANALYSES OF MUNICIPAL GAS ACCOUNTS for 1907-8, and the "GAS WORLD" ANALYSES OF GAS COMPANIES' ACCOUNTS for 1908. Each, $4.

PUBLIC LIGHTING BY GAS AND ELECTRICITY. By W. J. Dibdin. $8.

FIELD'S ANALYSIS, 1907. $5.

THE MACBETH CALCULATOR OF HANDY FORMULAS FOR ILLUMINATION. $4.50.

AMERICAN GAS ENGINEERING PRACTICE. By M. Nisbet Latta. $4.50.

JONES JET PHOTOMETER, for Coal or Water Gas. Each $10.

ELECTRICITY.

ELECTRIC WIRING DIAGRAMS AND SWITCHBOARDS. By Newton Harrison, E.E. $1.50.

CARE AND MANAGEMENT OF ELECTRIC POWER PLANTS. By Norman H. Schneider. Cloth, $1.50. Leather, $2.50.

INDUSTRIAL PHOTOMETRY, with Special Application of Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Kapp. $3.50.

ELECTRICIAN'S POCKET-BOOK. By Monroe and Jamieson. $2.50.

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.

ELECTRIC LIGHTING, by Francis B. Crocker. $3.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

AMERICAN GAS LIGHT JOURNAL, 42 Pine Street, New York City.

THE HUMPHREY

GAS ARC LAMP,

Designed, Developed and Distinguished as

"The Gas Company's Lamp,"

Has been one of the most conspicuous successes of the past decade in lighting lines. The competing lamps that were brought out in scores during the earlier days had but a brief life and exist to-day principally as unpleasant memories of ill-considered purchases. **Is not the same thing about to be repeated with Inverted Gas Arc Lamps?**

Adopt the **Humphrey Inverted** as your standard and be insured and protected by the strongest, most liberal and progressive gas lighting organization in the world.

GENERAL GAS LIGHT CO.,

Kalamazoo. **New York.** **San Francisco.**
London, England. **Bremen, Germany.** **Wellington, New Zealand.**

Write for their catalog

CAUTION.

In selecting a gas meter insist on it being sensitive on small volumes and large in capacity, with slight absorption of pressure—this means PROFIT to the gas company.

The IRONCLAD could be made cheaper—but we would then have competition.

The IRONCLAD is in a class by itself. It offers a service rendered by no other meter made.

Ironclad CAST IRON DRY Gas Meters

Being encased in iron, the *Ironclad* may be placed anywhere—outside or inside; in wet places or dry places; in warm places or cold places. Made for *Natural, Artificial or Acetylene Gas.* Whether you buy *Ironclads* or not, you owe it to yourself to investigate them.

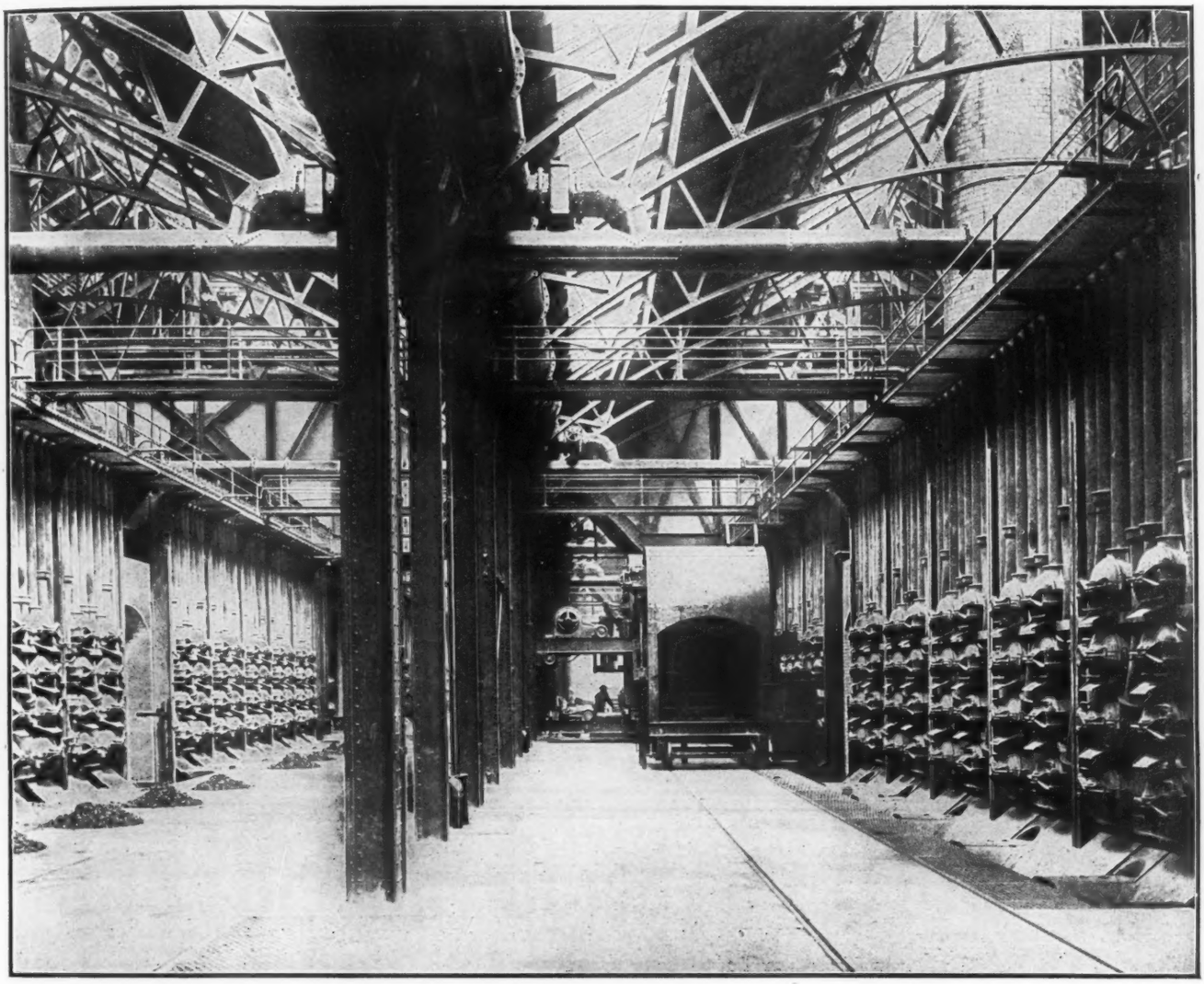
CATALOG 100 FREE

Pittsburg Meter Company

NEW YORK, 149 Broadway.
CHICAGO, 256 Madison Street.
KANSAS CITY, 6 West Tenth Street.
SEATTLE, 8th and Madison Streets.
SAN FRANCISCO, 149 New Montgomery St.

General Office and Works,
East Pittsburg, Pa.

MANUFACTURERS OF GAS METERS AND WATER METERS.



Eleven Millions Capacity in One Retort House.

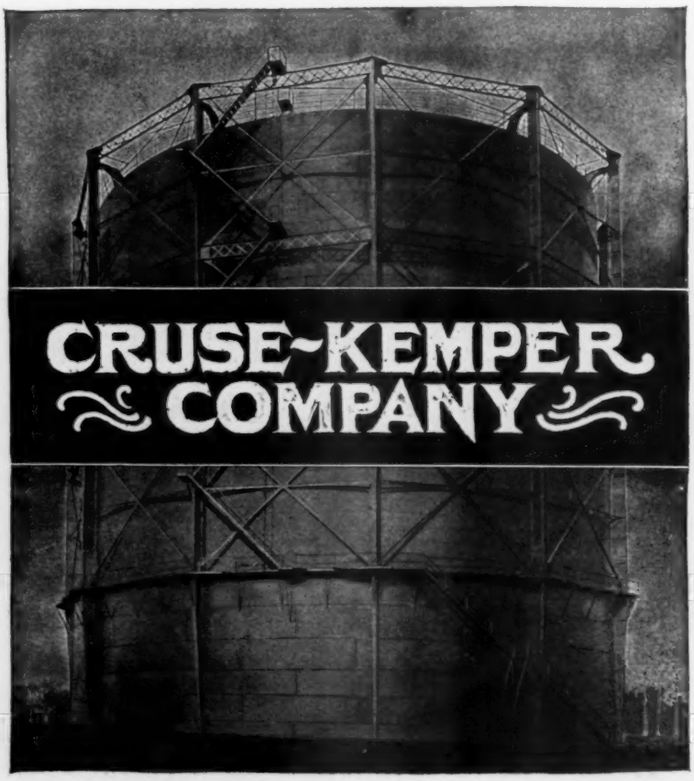
RITER-CONLEY MFG. COMPANY,

PITTSBURGH.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

COMPLETE COAL GAS PLANTS.

GAS ENGINEERS,
BUILDERS OF
GAS HOLDERS,
PURIFIER BOXES,
CONDENSERS,
SCRUBBERS,
STEEL TANKS,
PLATE METAL CONSTRUCTION.



CRUSE-KEMPER COMPANY

STEEL WATER AND TRANSMISSION TOWERS.
STEEL BUILDINGS and ROOF TRUSSES.
STRUCTURAL IRON & STEEL WORK IN GENERAL.

OFFICE AND WORKS, - - - - AMBLER, PA.

J. S. DeHART, JR., PRESIDENT
A. F. WEHNER, SECRETARY
R. K. WEHNER, TREASURER

ISBELL-PORTER COMPANY

GAS ENGINEERS & BUILDERS OF GAS WORKS

BENCH WORK
CHARGING AND DISCHARGING MACHINERY
MACKENZIE EXHAUSTERS
PRIMARY AND SECONDARY CONDENSERS FOR FRESH OR SALT WATER

ISBELL VALVES SPECIALS
TAR EXTRACTORS
P&A. TAR EXTRACTORS FOR WATER GAS
ROTARY AMMONIA SCRUBBERS
SHAVING SCRUBBERS PURIFIERS STREET GOVERNORS

MAIN OFFICE AND WORKS
BRIDGE & OGDEN STREETS
NEWARK, N. J.
ESTABLISHED 1865

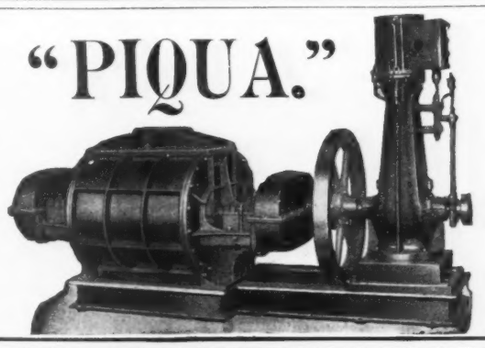
GAS EXHAUSTERS AND BLOWERS.

We have a full line of sizes for all standard pressures. The design, material and workmanship is A-1. Prompt Delivery and Reasonable Prices. WHY NOT give us YOUR requirements?

THE PIQUA BLOWER CO.,

PIQUA, OHIO.

"PIQUA."



THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

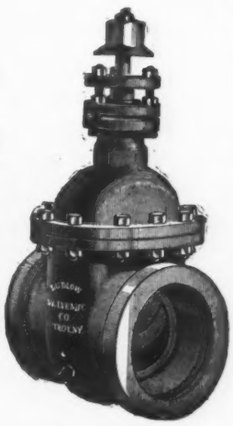
Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.



QUINTARD IRON WORKS CO.,

Foot of Twelfth Street and East River, New York,

BENCH WORK,
CONDENSERS,
SHAVING SCRUBBERS,
CAST IRON FLANGED PIPE,
RIVETED STEEL PIPE.

FREDERICK W. FLOYD, Engineer.

ESTABLISHED 1856.

HENRY MAURER & SON,

Manufacturers of

High Grade Firebrick, Blocks, Tiles,

ETC.,

Works: Maurer, N. J. Office: 420 E. 23d St., N. Y. City.

L. C. Hamlink, President *Geo. F. Vater, Engineer and Chemist* *August Court, Secretary*

GAS BENCH CONSTRUCTION CO.

ST. LOUIS, MO.

ENGINEERS AND BUILDERS

OF COAL GAS BENCHES

"BETTER BENCHES"

All Workmanship, Material and Results Guaranteed.

16 YEARS EXPERIENCE DESIGNING, BUILDING AND OPERATING BENCHES

All Retorts and Settings Manufactured under the supervision of Our Own Chemist and Engineer

We make a special High Grade Water Gas Lining Material and Checker Brick

PRACTICAL HANDBOOK ON GAS ENGINES, WITH INSTRUCTIONS FOR CARE AND WORKING OF THE SAME,

By G. LIECKFELD, C.E. Translated with Permission of the Author, by GEORGE M. RICHMOND, M.E. Price, $1.

For Sale by AMERICAN GAS LIGHT JOURNAL, 42 Pine Street, New York City.

THE PARKER-RUSSELL MINING AND MFG. CO.,

Saint Louis, Missouri. **New York Office, 45 Broadway.**

Gas Retort Benches.
Longest life—largest output per retort—lowest fuel results—greatest ease of operation.
Water Gas Linings.
Fiddes-Aldridge Discharging Charger.
Large stock of retorts and settings on hand.
All our wares are manufactured at our own plant from clays mined at our mines.

All contracts made as of St Louis. Correspondence Solicited.

SEE FULL-PAGE ADS.,

★ Star Retorts.

May 17th, June 28th, August 16th,
June 7th, July 26th, Septem. 6th,

— AND ALSO —

Semi-Centennial Number.

★ Star Machinery.

EVENS & HOWARD FIRE BRICK CO.,
ST. LOUIS, MO.
ENGINEER GAS WORKS DIVISION:
A. S. B. LITTLE.

IT IS ABSOLUTELY NECESSARY

that people be reminded continually that you are ready to sell them the things they want. This is a big world, with lots of people in it, and you are easily forgotten if you don't keep buyers posted. What you should do is to tell them about your product to-day, remind them to-morrow, and keep on reminding them thereafter. If you do this, when the buyer is ready to place his order he will remember you. :: :: :: :: :: :: :: :: :: ::

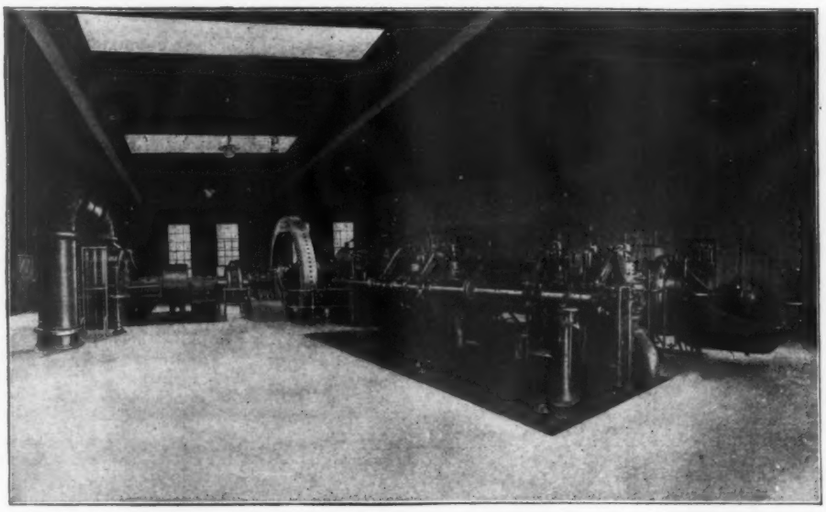
An Advertisement in the AMERICAN GAS LIGHT JOURNAL

is the best and surest means of keeping your name and product before the buyers. :: ::

1859. FIFTY YEARS. 1909.

ROOTS' EXHAUSTERS.

A half century of experience, up-to-date engineering and shop facilities embodied in these **World Famous Gas Exhausters.**



An Installation for the Peoples Gas Light and Coke Co., Chicago, Ill., handling 1,000,000 c. ft. per hour, under six (6) pounds per square inch.

P. H. & F. M. ROOTS COMPANY,

HOME OFFICE: Connersville, Ind. NEW YORK OFFICE: 120-122 Liberty St. CHICAGO OFFICE: 1547 Marquette Bldg.

SEND FOR POCKET EDITION OF "ENGINEERS' PRACTICAL REFERENCE BOOK."

PRACTICAL HANDBOOK ON

GAS ENGINES,

With Instructions for Care and Working of the Same,

By G. LIECKFELD, C.E.

Translated with Permission of the Author, GEO. M. RICHMOND, M.E.

PRICE, $1.00.

FOR SALE BY

AMERICAN GAS LIGHT JOURNAL, 42 Pine St., New York City.

The "Gas World" Analyses of Municipal Gas Accounts, FOR 1907-1908,

AND

The "Gas World" Analyses of Gas Companies' Accounts, FOR 1908.

The former showing at a glance 69 accounts and the latter 55 accounts of Coal and Water Gas Companies, itemized under

Coal Carbonized, Gas Made and Sold, Yield of Residuals, Public Lamps, Mileage of Mains, Consumers, Price of Gas, Illuminating Power, Financial Results, Revenue.

Manufacturing Charges, Rates and Taxes, Distribution Charges, Management Charges, Bad Debts, Capital Paid Up, Capital per Ton and per Thousand, Reserve Funds, etc.

EVERY GAS ENGINEER AND MANAGER SHOULD HAVE A COPY OF THIS INVALUABLE AND UP-TO-DATE WORK.

Price, $4 each. For Sale by AMERICAN GAS LIGHT JOURNAL, 42 Pine Street, New York City.

BRAY BURNERS HAVE BEEN USED FOR MORE THAN FORTY YEARS.

In that time they have been recommended and used by the leading gas experts, endorsed by the U. S. Government Inspectors of Gas, as well prominent State Inspectors.

To-day the Bray is the only high-grade, absolutely reliable open flame burner on the market.

W. M. CRANE COMPANY,

16, 18 and 20 West 32d Street, New York,

SOLE AGENTS FOR GEO. BRAY & CO., LEEDS, ENGLAND.

GEORGE ORMROD, Pres. & Treas. JOHN D. ORMROD, Supt.
J. G. EBERLEIN, Secretary.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

Celebrated Lux Gas Purifying Mass

Will Save 50 Per Cent. Labor.

Used in the Gas Works of Berlin, Kiel, Frankfort, Vienna, Amsterdam, Antwerp. London, Edinburgh, Copenhagen, Madrid, Seville, Barcelona, Rio de Janeiro and others. :: :: ::

Sole Importer, F. BEHREND,
54 Front St., New York.

Practical Handbook on

GAS ENGINES,

With Instructions for Care and Working of the Same,

By G. LIECKFELD, C.E.

Translated with Permission of the Author.
By GEO. M. RICHMOND, M.E.

Price, $1. *For Sale by*
AMERICAN GAS LIGHT JOURNAL,
42 Pine St., New York City.

Alcohol, its Manufacture from Farm Products and De-Naturing. By F. B. WRIGHT.

Price, $1. *For Sale by*
A. M. Callender & Co., 42 Pine St., New York City.

Modern Machine Shop Construction, Equipment and Management, by OSCAR E. PERRIGO, M.E.

Price, $5. For Sale by
A. M. CALLENDER & CO., 42 Pine St., New York City.

TRADE MARK

BRISTOL'S

REG. U. S. PAT. OFFICE.

RECORDING GAUGES

For All Commercial Ranges of

PRESSURE AND VACUUM.

Write for New Preliminary Bulletin No. 104.

BRANCH OFFICES: { New York. / Chicago.

THE BRISTOL CO., WATERBURY, CONN.

EVERYONE INTERESTED IN GAS MATTERS

Should have a Copy of our 50th Anniversary Number (Price, 50c.), Containing the Following Articles:

Four Men whose Work in Fraternizing the Gas Industry was of the Pioneer Type. Arthur E. Boardman.

Gas Association Work and its Influence in and on the Gas Industry for the Last Half Century. George G. Ramsdell.

A Rapid Review of Gas Manufacture in New York City for the Last 50 Years. Dr. A. H. Elliott.

Fifty Years of Street Lighting in the City of New York. H. Thurston Owens.

Historical Notes Respecting the Development of the Last Half Century in the Gas Business of the Pacific Coast. John A. Britton.

Processes I Have Known. Frederic Egner.

Fifty Years' Progress in the Gas Industry in Canada. William H. Pearson.

Progress of the Gas Industry of Great Britain in the Last 50 Years. N. H. Humphrys.

Gas Coals of America. James D. Perkins.

A Half-Century History of Water Gas. F. N. Morton.

The Development of the Public Utilities Commissions as Applied to the Gas and Electric Business. C. J. Russell Humphreys.

A Half-Century's History of Gaseous Fuel as Applied to Heating Gas Retorts. F. Bredel.

Systems of Vertical Retorts. Fred. J. Mayer.

Development of the Ammonia Industry in Gas Works during the Last 50 Years. R. W Hilgenstock.

Residuals, Some History of. Carroll Miller.

Meters and Meter Makers. D. McDonald.

Progress in Electric Current Development in the Artificial Lighting Field. A. F. Ganz.

Development of the New Business Division of the Gas Industry during the Last 50 Years. Philmer Eves.

Growth and Value of Demonstration Work in the Household of Gaseous Fuel. Helen Armstrong.

"Uncle Jerry" in Reminiscent Mood. J. B Howard.

Present-Day Photometrical Practice. W. H. Gartley.

The Boston Gas Supply during 50 Years. William McKay.

Development in Pipe Manufacture. George W. Whyte.

Public Utility Commissions. Rufus C. Dawes

Heating Machines. E. P. Reichhelm.

AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

NOVEMBER, 1909.

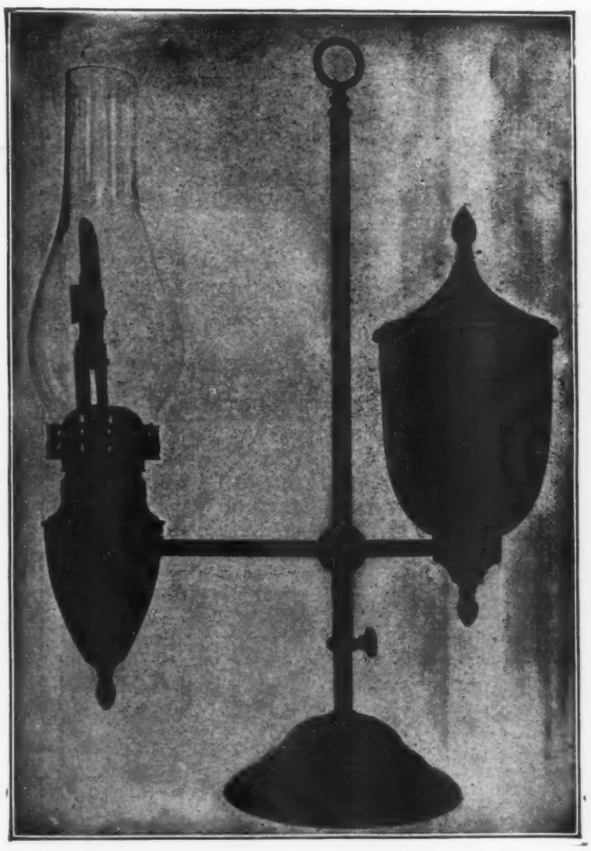
Table No. 1.
FOLLOWING THE MOON.

Day of Week.	Date.	Light.	Extinguish.
Mon.	1	5.30PM	9.00PM
Tue.	2	5.30	10.00
Wed.	3	5.30	11.00
Thu.	4	5.30LQ	12.10AM
Fri.	5	5.30	1.10
Sat.	6	5.30	2.10
Sun.	7	5.20	3.10
Mon.	8	5.20	4.10
Tue.	9	5.20	5.40
Wed.	10	5.20	5.40
Thu.	11	5.20	5.40
Fri.	12	5.20NM	5.40
Sat.	13	5.20	5.40
Sun.	14	5.10	5.50
Mon.	15	5.10	5.50
Tue.	16	5.10	5.50
Wed.	17	7.20	5.50
Thu.	18	8.20	5.50
Fri.	19	9.30	5.50
Sat.	20	10.40FQ	5.50
Sun.	21	11.50	5.50
Mon.	22	1.10AM	5.50
Tue.	23	2.20	5.50
Wed.	24	3.30	5.50
Thu.	25	No L.	No L.
Fri.	26	No L FM	No L.
Sat.	27	No L.	No L.
Sun.	28	5.10PM	6.50PM
Mon.	29	5.10	7.40
Tue.	30	5.10	8.40

TOTAL HOURS DURING 1909.

By Table No. 1.

	Hrs.Min.
January	212.20
February	183.40
March	173.00
April	151.10
May	144.10
June	138.50
July	145.40
August	160.30
September	180.00
October	201.00
November	216.30
December	233.40
Total, yr.	2140.30



THE ELLIOTT KEROSENE STANDARD PHOTOMETER LAMP.

✻✻✻

10-Candle Power.

✻✻✻

This lamp is a perfect substitute for the 10-candle Pentane Lamp hitherto used, and has the following advantages:

1st. It uses Standard Kerosene Oil (Pratt's Astral Oil or equivalent).

2d. It is remarkably steady. Will burn 24 hours continuously with less than 2 per cent. variation.

3d. It is much less dangerous than Pentane, which is a kind of gasolene.

4th. It is not easily affected by air currents in the photometer room.

5th. Since the lamp may burn continuously, the candle power of gas may be taken at any moment, if necessary. This insures steady illuminating power without waste of carburetting material.

6th. The first cost of the lamp brings it within the reach of even small gas works.

7th. Costs much less to maintain than a Pentane lamp or sperm candles doing the same service.

8th. Is not affected by the weather.

PUBLIC LIGHTING TABLE.

NOVEMBER, 1909.

Table No. 2.
NEW YORK CITY.
All Night Lighting.

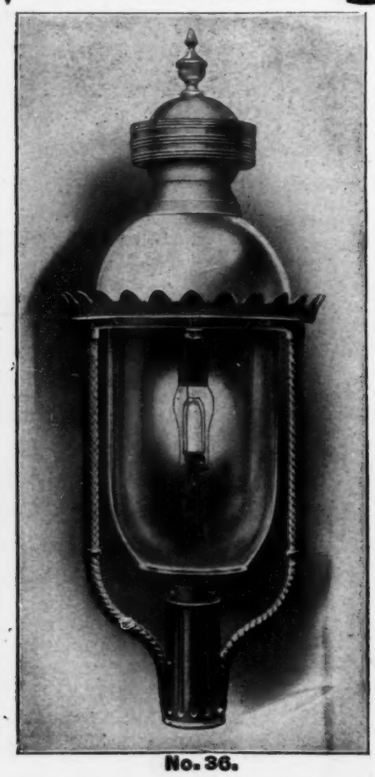
Day of Week.	Date.	Complete Lighting in One Hour From Time Given P. M.	Complete Extinguishing in 50 Minutes From Time Given A. M.
Mon.	1	4.37	5.17
Tue.	2	4.37	5.17
Wed.	3	4.37	5.17
Thu.	4	4.37	5.17
Fri.	5	4.27	5.27
Sat.	6	4.27	5.27
Sun.	7	4.27	5.27
Mon.	8	4.27	5.27
Tue.	9	4.27	5.27
Wed.	10	4.27	5.27
Thu.	11	4.27	5.27
Fri.	12	4.17	5.32
Sat.	13	4.17	5.32
Sun.	14	4.17	5.32
Mon.	15	4.17	5.32
Tue.	16	4.17	5.32
Wed.	17	4.17	5.32
Thu.	18	4.17	5.32
Fri.	19	4.12	5.42
Sat.	20	4.12	5.42
Sun.	21	4.12	5.42
Mon.	22	4.12	5.42
Tue.	23	4.12	5.42
Wed.	24	4.12	5.42
Thu.	25	4.12	5.42
Fri.	26	4.07	5.52
Sat.	27	4.07	5.52
Sun.	28	4.07	5.52
Mon.	29	4.07	5.52
Tue.	30	4.07	5.52

TOTAL HOURS DURING 1909.

	Hrs.Min.
January	428.30
February	358.15
March	353.10
April	298.10
May	263.20
June	234.45
July	248.30
August	278.00
September	311.25
October	370.05
November	397.40
December	438.35
	3980.25
Deduct on account of 50 min. extinguishing time	30.25
Total, yr.	3950.00

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 512 Oak Street.

WELSBACH STREET LIGHTING COMPANY



No. 36.

....OF AMERICA....

Controls and Operates the **Welsbach System of Street Lighting,**

Which includes its specially DESIGNED and PATENTED BURNER for PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

Welsbach Inverted Portico Lamps

No. 901. INVERTED PORTICO LAMP. Single Burner.

For all semi-exposed places—porticos, entrances, etc. Simple in construction, few parts; exterior made of enameled steel, interior parts of heat-resisting material that are practically indestructible. Wind, storm and insect proof.

The globes on designs No. 901 and No. 902 are supported in a flanged reflector that provides for heat expansion. The reflector being hinged, it can readily be lowered for cleaning or trimming the lamp.

Gas and pilot-flame adjustment by means of needle valves from outside of lamp. The pilot-flame is protected and will not blow out.

Three Styles from which to Choose:

No. 902.

Equipped with No. 5 clear globe and steel enameled reflector 8¾ inches in diameter and 1½ inches deep. Finish, dark green enamel.

Dimensions: Length over all, 16 inches; diameter of globe, 5 inches; depth of globe, 4 inches. List price, complete, without mantles... $8.00

No. 900.

Equipped with 7-inch alabaster or sand-blast ball globe. Finish, dark green, or white and gold enamel. Dimensions: Length over all, 17½ inches.

White and gold enamel. List price, without mantles..... $9.00

Dark green enamel. List price, without mantles..... $8.00

No. 901.

Same as 902 portico lamp, except steel enameled reflector, which is flat, and 10 inches in diameter.

List price, complete, without mantles.. ..... $8.00

WRITE FOR DISCOUNTS.

WELSBACH COMPANY,

Gloucester, N. J. —FACTORIES— Columbus, Ohio.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

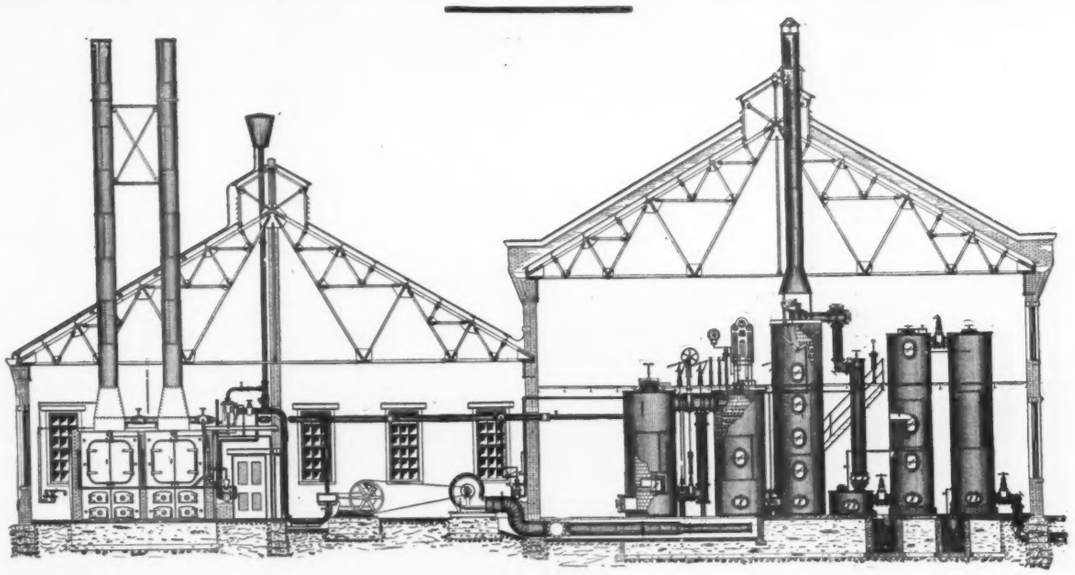
LESSEES, OPERATORS AND BUILDERS OF **GAS WORKS.**

Largest Builders of CARBURETTED WATER GAS PLANT IN AMERICA.

SOLE AMERICAN BUILDERS

OF THE

Standard Double-Superheater Lowe Water Gas Apparatus.



TOTAL SETS INSTALLED TO JULY 1, 1909, ... 704
TOTAL DAILY CAPACITY TO JULY 1, 1909, ... 577,440,000 cu. ft.

Tar Extractors for Carburetted Water Gas.
Photometrical Apparatus.
Gas Analysis Apparatus.
Recording Gauges.
Straight Standpipe System for Coal Gas Retorts.
Straight Standpipe Cleaners.
Waste Heat Boiler.
Hygrometer.
Meters for Regulating Air and Steam Supply to Water Gas Apparatus.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES, FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

GEROULD'S IMPROVED RETORT CEMENT.

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. NEW CASTLE, PA.
In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD,
29 North Mill St., New Castle, Pa.

KRATER-DINAS RETORT CEMENT.

Universally accepted to be the best cement for patching and repairing retorts, making up bench work, etc. Advantages: Powdered form; only mix with water; no waste; too much mixed, apply water and use the next time; adheres very easy; does *not* fall out by decarbonization. We guarantee or take back. Many re-orders and recommendations from America, Germany, France, Belgium, etc. Write for price and testimonials.

STRASSBURGER BROS., Sole Importers,
563 Lincoln Avenue, Chicago, Ills.

"BEST BY TEST."

ESTABLISHED 1868.

L. N. RANCKE, V. Pres. & Mgr. E. L. RIEHA, Engineer.

BALTIMORE RETORT & FIRE BRICK COMPANY.

COAL GAS BENCHES.

HORIZONTAL RETORTS.
INCLINED RETORTS.
VERTICAL CHAMBERS.

WALDO BROS., 102 Milk St., **BOSTON, MASS.,**
NEW ENGLAND AGENTS.

JOHN DELL,
President and General Manager.

MISSOURI FIRE BRICK CO.,

ESTABLISHED 1882.

MANUFACTURERS OF

Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are the **Exclusive Agents** *for the* **Mitchell Patent Benches,** *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* **Rear Clinkering.** **The Mitchell** *is the* **Original Coal Firing Bench.** *We also Erect Plain Benches with* **One** *to* **Six Retorts.**

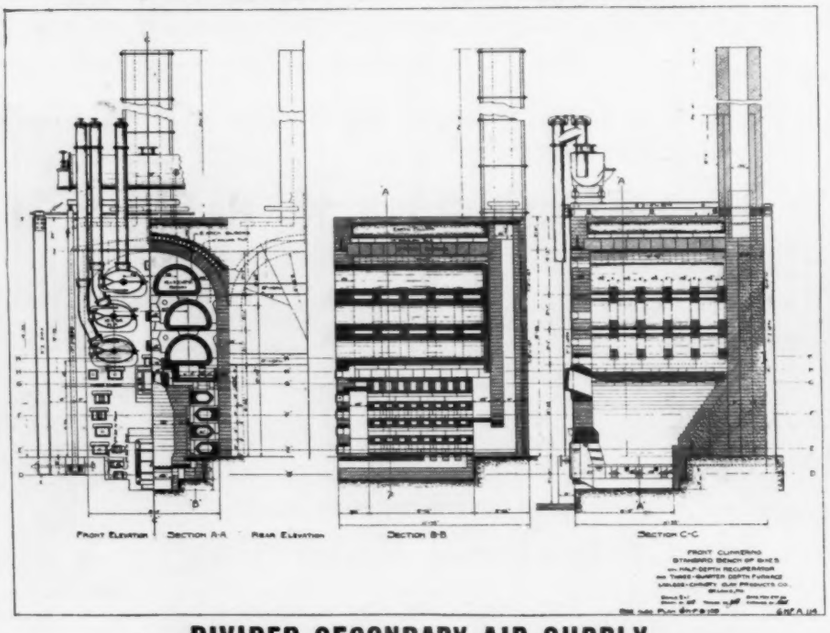
YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.

City Office: *411 Olive Street, Continental Bank,* ST. LOUIS, MO.

DEEP FURNACE.
That Means Complete Conversion of Primary Air at All Times.

LARGE GRATE AREA.
That Means Slow Travel of Primary Air and Less Clinkers.

TILE RECUPERATORS.
That Means
NO BRICK,
LESS JOINTS,
NO LEAKS.



TILE SETTINGS.
That Means
HEAVY CONSTRUCTION,
LESS JOINTS,
SELF-SUPPORTING.

DIVIDED SECONDARY AIR SUPPLY.
That Means Distribution of Heat Under Absolute Control.

STANDARD FRONT-CLINKERING BENCH OF SIXES.

"LACLEDE-CHRISTY,"
ST. LOUIS, MO.

EXPERT INSPECTION of Holders and Other Structures During Construction.
ECONOMIC DESIGN of Steel Structures, Reinforced Concrete, Masonry and Foundations.
CHAMBERS & HONE, Consulting Engineers, ... 1 Liberty Street, New York City

Bronder Patent Stoking Machinery.

Three-Scoop and Three-Rake Charging and Discharging Machines are operating in New York, Newark, N. J., Philadelphia, Worcester, Mass., Mt. Vernon, N. Y., Toronto and Montreal, Canada, Detroit, Seattle, Rochester and St. Louis.

Four-Scoop and Four-Rake Charging and Discharging Machines are operating in Detroit, Mich., and Cincinnati, Ohio. These are the only machines that will draw or charge simultaneously 3 or 4 retorts (vertically) and handle from 42 to 60 retorts in from 25 to 30 minutes, lid opening and closing and filling of furnaces included.

Hot **Coke Conveyor, Quencher and Steam Exhauster,** operating in Toronto, Canada, working in water-sealed flue, rollers being protected from heat and grit.

COAL CRUSHERS, CONVEYORS AND BINS. TURNTABLES FOR MACHINES.

Labor-Saving Machines for Handling Coal and Coke from Coal Cars to Coke Yard or Bins. Coke Screening and Measuring Plants a Specialty.

G. A. BRONDER,
Contracting Engineer and Builder,
229 BROADWAY, NEW YORK.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

Automatic, Balance, High Pressure and Service Governors,
Unison Telemetric Pressure Gauge,

Iron Sponge, Purifying Material for Gas Purification, Manufacturers of Jones Jet Photometers, The National Smoke and Ammonia Helmet, Sulphur Testers, High and Low Pressure House Governors. . . . . .

Wide Experience
In High Pressure
Installation
and
Extension.

PACIFIC COAST AGENT:
VAN E. BRITTON,
SAN FRANCISCO, CAL.

50 CHURCH ST., NEW YORK CITY.
295 WEST 22D ST., CHICAGO, ILLS.

12-Inch High Pressure Governor.

REYNOLDS' GAS REGULATOR COMPANY,

ANDERSON, IND., U. S. A.

We make all sizes for all classes of reduction,

Double and Single District Stations,
And Individual Service Governors for Reducing High Pressure.

HOLDER GOVERNORS
And Low Pressure Regulators, all of the Dry Diaphragm type.

English Agents:
THE BRYAN DONKIN CO., LTD., Chesterfield, England.

Write for Catalog.

Combination Governor.
(Governor and Mercury Seal.)

Newbigging's Handbook for Gas Engineers and Managers.

Price, $6.50. For Sale by
A. M. CALLENDER & CO., 42 PINE ST., NEW YORK CITY.

COAL TAR AND AMMONIA,

By GEORGE LUNGE, PH.D. Third and Enlarged Edition.
Price, $15. For Sale by
A. M. CALLENDER & CO., 42 Pine Street, New York City.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

**OCEAN MINE YOUGHIOGHENY GAS COAL,
OLD KENTUCKY SHALE AND O. K. BOGHEAD.**

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully Prepared,
For Gas Making or
Heavy Steaming. .

A. C. M. AZOY, General Agent, 1 Broadway, New York.

PETER YOUNG, President. Works. LOCKPORT STATION, PA.

ESTABLISHED 1864.

JAMES GARDNER, JR., CO.,

Successor to WILLIAM GARDNER & SON.

N. A. YOUNG, Secretary and Treasurer.
Address all communications to
JAMES GARDNER, JR., CO., Bolivar, Pa.

Fire Clay Goods for Gas Works.

Double Gate Valves.

A LARGE STOCK ON HAND READY FOR PROMPT SHIPMENT.

These valves are provided with double discs or gates, and are tight with the gas pressure on either side of them.

The discs are so arranged as to be free from their seats when being opened or closed, and are operated by a quick-acting mechanism. The valve stem extends outside of the bonnet, and serves as an index, showing whether the valve is closed or open, and the amount of opening. They are made of the following dimensions:

Size.....	8 inches	10 inches	12 inches	16 inches	20 inches	24 inches	30 inches	36 inches
Diameter of flanges....	13 inches	16 inches	18 inches	22½ inches	27 inches	31 inches	31½ inches	44 inches
Face to face of flange...	12 inches	12 inches	12 inches	14 inches	17 inches	20 inches	21 inches	23⅝ inches

For price and other information, apply to

THE CONTINENTAL IRON WORKS,
P. O. STATION G. NEW YORK (BOROUGH OF BROOKLYN).

Directory of American Gas Companies, 1909.

Price, $5.00.
For Sale by
A. M. Callender & Co., 42 Pine St., N. Y.

GAS ANALYST'S MANUAL. By JAQUES ABADY. Price, $6.50. For Sale by A. M. Callender & Co., 42 Pine St., N. Y. City.

KELLER ADJUSTABLE COKE CRUSHER

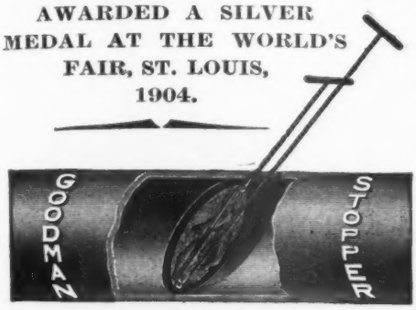
Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER

Columbus, Ind.

Correspondence Solicited.

AWARDED A SILVER MEDAL AT THE WORLD'S FAIR, ST. LOUIS, 1904.



AGENTS.

Pacific Coast—VAN E. BRITTON, 269 Monadnock Building, San Francisco, Cal.

Great Britain—PARKER & LESTER, Old Kent Road, London.

MANUFACTURED BY

SAFETY GAS MAIN STOPPER CO.,

257-263 East 133d Street,

NEW YORK CITY.

PATENTS, TRADE MARKS, COPYRIGHTS.

ROYAL E. BURNHAM,

Solicitor of Patents and Counsellor in Patent Causes.

833 Bond Building, Washington, D. C.

Send for Pamphlet on Patents.

EDMUND H. McCULLOUGH, President. H. C. ADAMS, 1st Vice President. CHAS. F. GODSHALL, 2d Vice-Pres. & Treas. HENRY WHARTON, Secretary. C. B. NICHOLS, Assistant Secretary.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

GAS MAINS—SERVICE PIPES.

Their installation for High or Low Pressure is the work in which we have specialized for years. Because of our Facilities and Experience, many Gas Companies prefer to contract with us for such work, rather than to execute it themselves. It proves to be as cheap in the end. We solicit inquiries.

Telephone Connection.

SULLIVAN BROS.,
11 Main St., Flushing, N. Y.

JOHN CABOT, President. GEO. D. CABOT, Secretary.

1412-1428 Adams Street, Hoboken, N. J.

PURIFIER AND SCRUBBER TRAYS.

Church's Patent Trays,

Reversible; Strongest; Most Easily Repaired.

We also Supply the Cheapest and Strongest

Reversible Bolted Trays.

Special Trays for Iron Oxide in Either Style

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.

Geo. Light,
DAYTON, O.

Standard Oil Company,

GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.

DAVIS & FARNUM MANUFACTURING CO.,

Waltham, Mass.

GAS HOLDERS

Steel Tanks for Naptha Storage, Machinery for Coal and Water Gas Plants.

H. M. BYLLESBY & COMPANY

(INCORPORATED),

GAS ENGINEERS,

DESIGN, CONSTRUCT AND OPERATE
COMPLETE COAL, WATER AND CRUDE OIL GAS PLANTS.

EXAMINATIONS AND REPORTS.

218 LA SALLE STREET, CHICAGO.

Oklahoma City, Okla. Mobile, Ala. San Diego Cal.

ALEX. C. HUMPHREYS, President.
WM. W. RANDOLPH, Vice-President.
EMILE GUILLAUDEU, Treasurer.
ROBT. O. LUQUEER, Secretary.
HOWARD E. WHITE, General Counsel.

EUROPEAN CORRESPONDENTS,
HUMPHREYS & GLASGOW,
LONDON. — BRUSSELS.

HUMPHREYS & GLASGOW, INC.,

CONSULTING ENGINEERS.

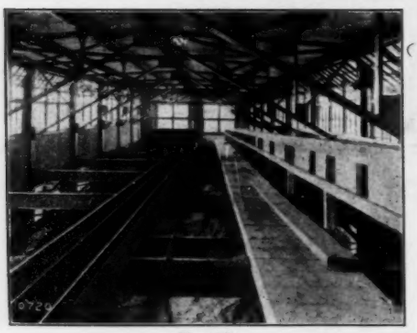
ADVICE AS TO EXTENSION, MANAGEMENT AND RECONSTRUCTION OF GAS AND ELECTRIC PLANTS.

COMPLETE EXAMINATIONS MADE. ~ ~ ~ PROPERTIES PURCHASED.

CITY INVESTING BUILDING, 165 BROADWAY, NEW YORK.

AUTOMATIC RAILWAYS

FOR COAL STORAGE.



No. 0720.

We have installed a number of automatic railways in power plants, for carrying the coal to the storage bins over the boilers. The special dumping arrangement enables the coal to be discharged at any point, thus securing even distribution of the coal in the bins.

SIMPLE,
SATISFACTORY,
ECONOMICAL and
EFFICIENT.

Write and Obtain More Information

C. W. HUNT COMPANY, WEST NEW BRIGHTON, N. Y.
NEW YORK CITY OFFICE, 45 BROADWAY.

HENRY I. LEA,

GAS ENGINEER.

DESIGN, CONSTRUCTION AND MANAGEMENT OF GAS PLANTS.

EXAMINATIONS AND REPORTS.

THE ROOKERY, CHICAGO.

FIELD'S ANALYSIS FOR THE YEAR 1907.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland; being the 39th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5. For Sale by

AMERICAN GAS LIGHT JOURNAL, 42 Pine St., N. Y. City.

The Bartlett-Hayward Company,

Baltimore, Md. 100 Broadway, New York.

GASHOLDERS,

Coal and Water Gas Plants.

Western Representative: W. A. BAEHR, Commercial National Bank Building, Chicago, Ills.

KERR MURRAY MANUFACTURING COMPANY,

Engineers and Manufacturers

APPARATUS FOR COAL GAS PLANTS,

SINGLE AND DOUBLE-LIFT GASHOLDERS
AND STEEL TANKS,

Latest Improved

ROTARY EXHAUSTERS, P. & A. TAR EXTRACTORS, AMMONIA WASHERS,

CONDENSING, SCRUBBING AND PURIFYING APPARATUS.

Street Specials and Valves.

ADDRESS:

KERR MURRAY MANUFACTURING COMPANY, {FORT WAYNE, IND.

R. D. WOOD & CO.,

400 CHESTNUT ST., PHILADELPHIA.

MANUFACTURERS OF

Cast Iron Pipe.

HEAVY LOAM CASTINGS,

Dunham Specials,

Hydraulic Work,

LAMP POSTS, VALVES, ETC.,

Gas Power Plants with Producers.

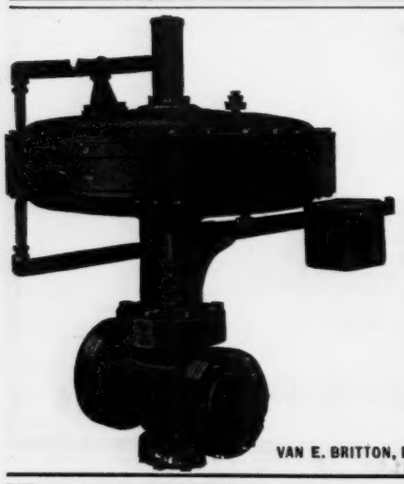
BUILDERS OF

Gasholders.

Single or Multiple Lifts, with or without Metal Tanks.

PURIFIERS, CONDENSERS, SCRUBBERS, BENCH WORK.

Cutler's Patent Freezing Preventer for Holder Cups.



THE FULTON GAS PRESSURE GOVERNORS

For Artificial or Natural Gas.
For District or Individual Service.

Our Improved **Duplex Sensitive Governor** for district service will reduce high pressure gas to inches of water without variation. Absolutely safe and reliable. No complicated mechanism to get out of order. No auxiliary regulators or other devices to assist the main governor required. The most simple and perfect governor ever placed on the market. We also manufacture Holder Governors, Compressor Governors and Individual Service Governors for any inlet and outlet pressure.

More than 20 years' experience with the largest gas companies. Send for Catalog.

THE CHAPLIN-FULTON MFG. CO.

VAN E. BRITTON, Pacific Coast Agent, Monadnock Bldg., San Francisco, Cal. 28-34 PENN AVE., PITTSBURGH, PA.

THESE BOOKS ARE NEW.

LIQUID AND GASEOUS FUELS,
By Vivian B. Lewes.
334 pages. . . . . Price, $2.

THE GAS ENGINE,
By Forrest R. Jones. 447 pages and 142 cuts. Price, $4.

HEATING,
By W. J. Baldwin.
Price, ... $2.50.

PUBLIC LIGHTING BY GAS and ELECTRICITY, By W. J. Dibdin. 528 pages. About 150 illustrations. Price, . . $8.

HEAT, ENERGY AND FUELS,
By Oskar Nagel. 306 pages and 118 illustrations. Price, $3.

PRODUCER GAS AND GAS PRODUCERS,
By Samuel S. Wyer. 295 pages. Price, $4.

LAW AND BUSINESS OF ENGINEERING AND CONTRACTING,
By Charles E. Fowler. Price, $2.50.

THE MACBETH CALCULATOR of Handy Formulas for Illumination.
Price, ... $4.50.

GAS PIPING AND GAS LIGHTING,
By W. P. Gerhard.
310 pages. . . . . Price, $3.

GAS POWER,
By F. E. Junge, M.A., C.E., M.E.
548 pages. . . . . Price, $5.

GAS, GASOLINE AND OIL ENGINES,
Including Producer Gas Plants.
By Gardner D. Hiscox, M.E. Price, $2.50.

PRACTICAL TESTING OF GAS AND GAS METERS,
By C. H. Stone. Price, ... $3.50.

STANDARD WORKS.

GAS MANUFACTURE,
By W. J. A. Butterfield.
Price, ... $2.50.

HANDBOOK ON GAS ENGINES,
By G. E. Lieckfeld, C.E. Translated by George M. Richmond, M.E. Price, $1.

GAS AND GAS WORKS,
By Hughes and O'Connor.
Price, ... $2.50.

CHEMISTRY OF GAS MANUFACTURE,
By Harold M. Royle, F.C.S.
Price, ... $4.50.

GAS MANUFACTURE FOR STUDENTS,
By John Hornby.
Price, ... $1.50.

COAL TAR AND AMMONIA,
By George Lunge.
Price, ... $15.

GAS ANALYST'S MANUAL,
By Jacques Abady.
Price, ... $6.50.

SELF-INSTRUCTION FOR STUDENTS,
Elementary, Advanced, Constructional.
Price, ... Each, $1.50.

THE CALORIFIC POWER OF FUELS,
By Herman Poole.
Price, ... $3.00

MODERN RETORT SETTINGS,
By G. P. Lewis.
Price, ... $1.50.

ART OF ILLUMINATION,
By Dr. Louis Bell.
Price, ... $2.50.

GAS COMPANIES' BOOKKEEPING,
By Brearley and Taylor.
Price, ... $4.50.

We will be Glad to Furnish Any Engineering Book.
SEND CHECK, DRAFT, POST OFFICE or EXPRESS MONEY ORDER
AMERICAN GAS LIGHT JOURNAL, - - 42 PINE STREET, NEW YORK CITY.

THE STACEY MANUFACTURING CO.,

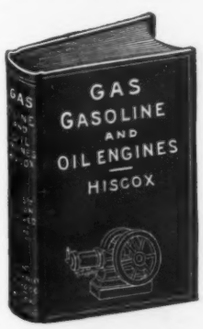
GAS ENGINEERS, DESIGNERS & BUILDERS.

GAS HOLDERS.

Roofs and Structural Steel Work.
Condensers—Washers—Extractors—Purifiers.
Bench Iron—Valves—Cast Iron Fittings and Specials.
Oil, Water and Storage Tanks of Every Description.
Stacks—Stand Pipe, Etc.

"CHOLLAR'S" PATENTED SYSTEM OF GAS PURIFICATION.

GENERAL OFFICES AND WORKS:
CINCINNATI, OHIO.
Western Office, = = = = 718 Mission Street, San Francisco.



JUST PUBLISHED, 15TH EDITION, REVISED, ENLARGED AND RESET.

Gas, Gasoline and Oil Engines,

INCLUDING GAS PRODUCER PLANTS,

By GARDNER D. HISCOX, M.E.

Author of "MECHANICAL MOVEMENTS," "COMPRESSED AIR," Etc.

PRICE, - - - - - $2.50.

The only complete American book on the subject for Gas Engine Owners, Gas Engineers and intending purchasers of gas engines, treating fully on the construction, installation, operation and maintenance of gas, gasoline, kerosene and crude petroleum engines.

The new rewritten, enlarged and revised 15th edition of this work has been prepared to meet the increasing demand for a thorough treatise on the subject. Its 450 pages give general information for everyone interested in this popular motive power and its adaptation to the increasing demand for a cheap and easily managed motor requiring no licensed engineer. It is fully illustrated by 351 Engravings and Diagrams. For sale by

A. M. CALLENDER & CO., - - - - - 42 Pine Street, New York City.

Gas Companies' Bookkeeping,

1906 EDITION,

By JOHN H. BREARLEY and BENJAMIN TAYLOR.

A Practical Treatise on the Keeping of Gas Companies' Accounts,

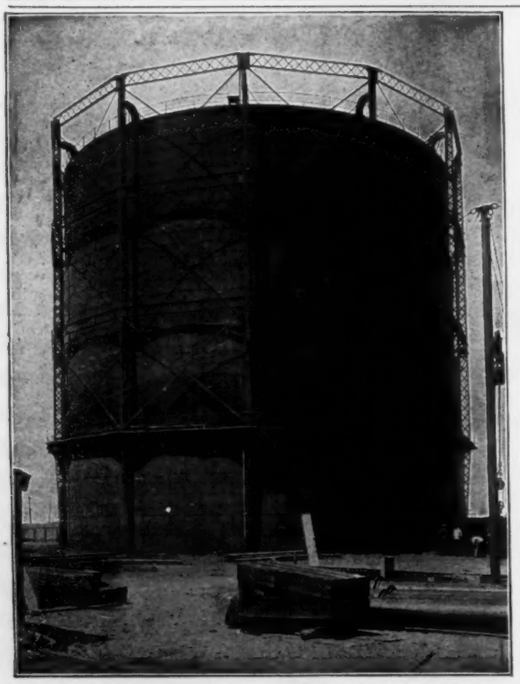
WITH USEFUL

FORMS FOR GAS UNDERTAKINGS.

PRICE, CLOTH, $4.50, MOROCCO, $6.50.

FOR SALE BY

A. M. CALLENDER & CO., - - - 42 Pine Street, New York City.



JOHN FOWLER, President. J. SCOTT FOWLER, Vice-Pres. & Treas.

DEILY & FOWLER MFG. CO.,

39 Laurel Street, Philadelphia, Pa.

ESTABLISHED 1842. INCORPORATED 1908.

BUILDERS OF

GASHOLDERS,

Single-Lift or Telescopic,

With or Without Steel Tanks.

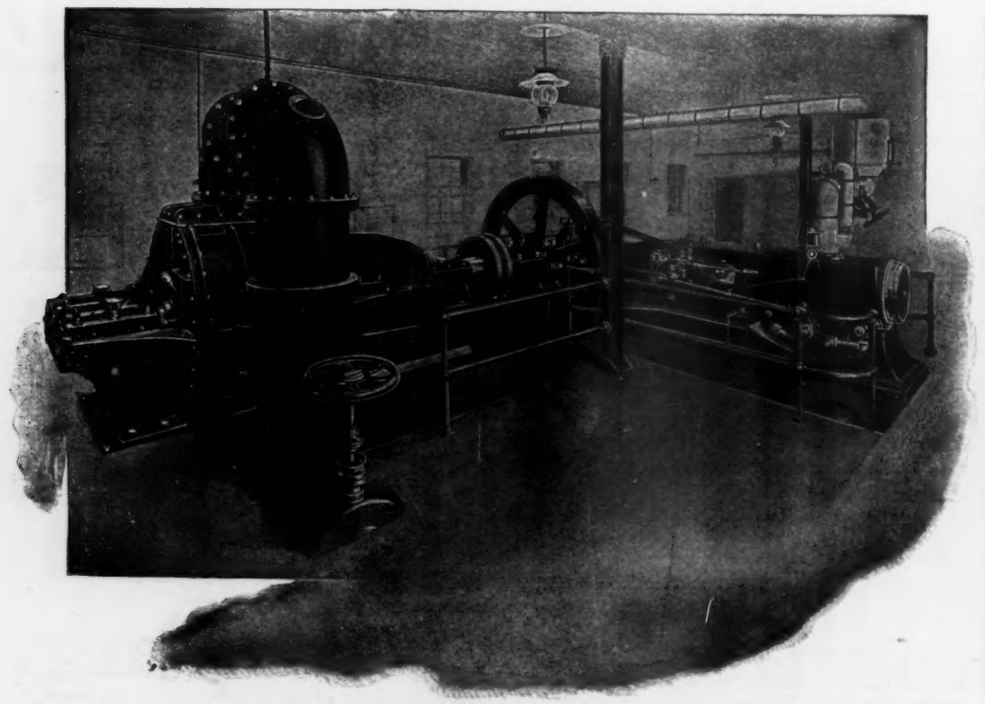
Oil Storage Tanks, Water Tanks, Etc.

ESTIMATES CHEERFULLY FURNISHED.

CORRESPONDENCE SOLICITED.

CONNERSVILLE GAS EXHAUSTERS

AND HIGH PRESSURE GAS PUMPS.



THIS cut shows one of our High Pressure machines and a 4-valve engine connected by one of our leather link flexible couplings. Two of these units were installed for the Peoples Gas Light and Coke Co., Chicago, at their 73d St. Station. Each machine has a capacity of 14,000,000 cubic feet per day.

We also manufacture

GAS VALVES,
BY-PASS VALVES,
PRESSURE REGULATORS,
ETC., ETC.

Correspondence Solicited.

THE CONNERSVILLE BLOWER COMPANY,
Connersville, Indiana, U. S. A.
NEW YORK OFFICE, 50 Church Street. - CHICAGO OFFICE, 536 Monadnock Bldg.

Newbigging's Handbook for Gas Engineers and Managers.

PRICE, $6.50.

For Sale by
AMERICAN GAS LIGHT JOURNAL, - 42 Pine St., New York City.

D. McDONALD & CO.,

971-997 BROADWAY, ALBANY, N. Y.,

MANUFACTURERS OF

DRY GAS METERS, STATION METERS, PREPAYMENT METERS, METER PROVERS AND GAUGES.

THE GLOVER PREPAYMENT METER,

Simple, Strong, Satisfactory.

THE HINMAN STATION METER DRUM,

The greatest advance that has been made in 20 years in the ACCURATE and ECONOMICAL measurement of gas in large quantities. :: :: ::

NEW YORK OFFICE: 561 West 47th Street. | ALBANY OFFICE: 991 Broadway. | CHICAGO OFFICE: Jefferson and Monroe Streets.

The Sprague Meter Co.

Manufacturers of

Cast Iron Gas Meters

for

Artificial or Natural Gas

Plain or Prepayment

Lower in first cost and cheaper to maintain than any meter on the market.

Write us for particulars.

The Sprague Meter Company

203 Water St., Bridgeport, Conn.

ALCOHOL, Its Manufacture from Farm Products and De-Naturing,

By F. B. WRIGHT.

A NEW AMERICAN BOOK.

CONTENTS.

Chapter 1. Alcohol, its various forms and sources.
" 2. Mashing, cooling and fermentation in general.
" 3. Distillation, simple forms of stills, the production of Alcohol from wine.
" 4. Malting.
" 5. Alcohol from Potatoes, mashing, fermentation, distillations, Continuous stills.
Chapter 6. Alcohol from Grain.
" 7. Alcohol from Beets.
" 8. Alcohol from Sorghum and Molasses.
" 9. De-natured Alcohol and its Commercial uses.
" 10. Alcoholometry. Index.

Fully Illustrated with Original Drawings of Necessary Apparatus.

PRICE, $1. For Sale by

AMERICAN GAS LIGHT JOURNAL, 42 Pine St., New York City.

NATHANIEL TUFTS METER COMPANY,

455 Commercial St., Boston, Mass.

PREPAYMENT GAS METERS,
WET AND DRY GAS METERS, STATION METERS, ETC.

REPAIRING OF ALL MAKES OF METERS, AND FITTED WITH OUR PREPAYMENT ATTACHMENT.

B
METERS.

INCREASED CAPACITY.
INCREASED EFFICIENCY.

PREPAYMENT METERS, STATION METERS, METER PROVERS, ETC.

PROMPT AND CAREFUL ATTENTION TO ALL REPAIR WORK.

MARYLAND METER COMPANY,

BALTIMORE. — CHICAGO.

YOU NEED ONE OR MORE OF OUR COMPLAINT METERS.

METERS, Plain and Prepayment,

For Artificial or Natural Gas.

Repairing All Makes and Attachments Added if Desired.

SPECIAL METERS FOR ACETYLENE.

KEYSTONE METER COMPANY,

ROYERSFORD, PA.

JUDICIOUS ECONOMY IS EFFECTED

BY USING

5-L. IMPROVED GAS METERS.

LOW SPEED, LARGE DIAPHRAGMS, STRONGER CONSTRUCTION, LARGER CAPACITY.

FITTED WITH

THE NEW YORK PREPAYMENT ATTACHMENT.
STEEL BOX AND CABINET LOCK.

NEW YORK IMPROVED METER CO., 306-310 East 47th St., New York City.

PACIFIC COAST REPRESENTATIVE: THE NORTHWEST GAS EQUIPMENT CO., Portland, Ore.

AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Wet and Dry Gas Meters, Station Meters, Meter Provers,
Photometrical Apparatus, Gauges,

PREPAYMENT METERS,

REGULAR METERS REFITTED WITH PREPAYMENT ATTACHMENTS.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

Gas Analyst's Manual,

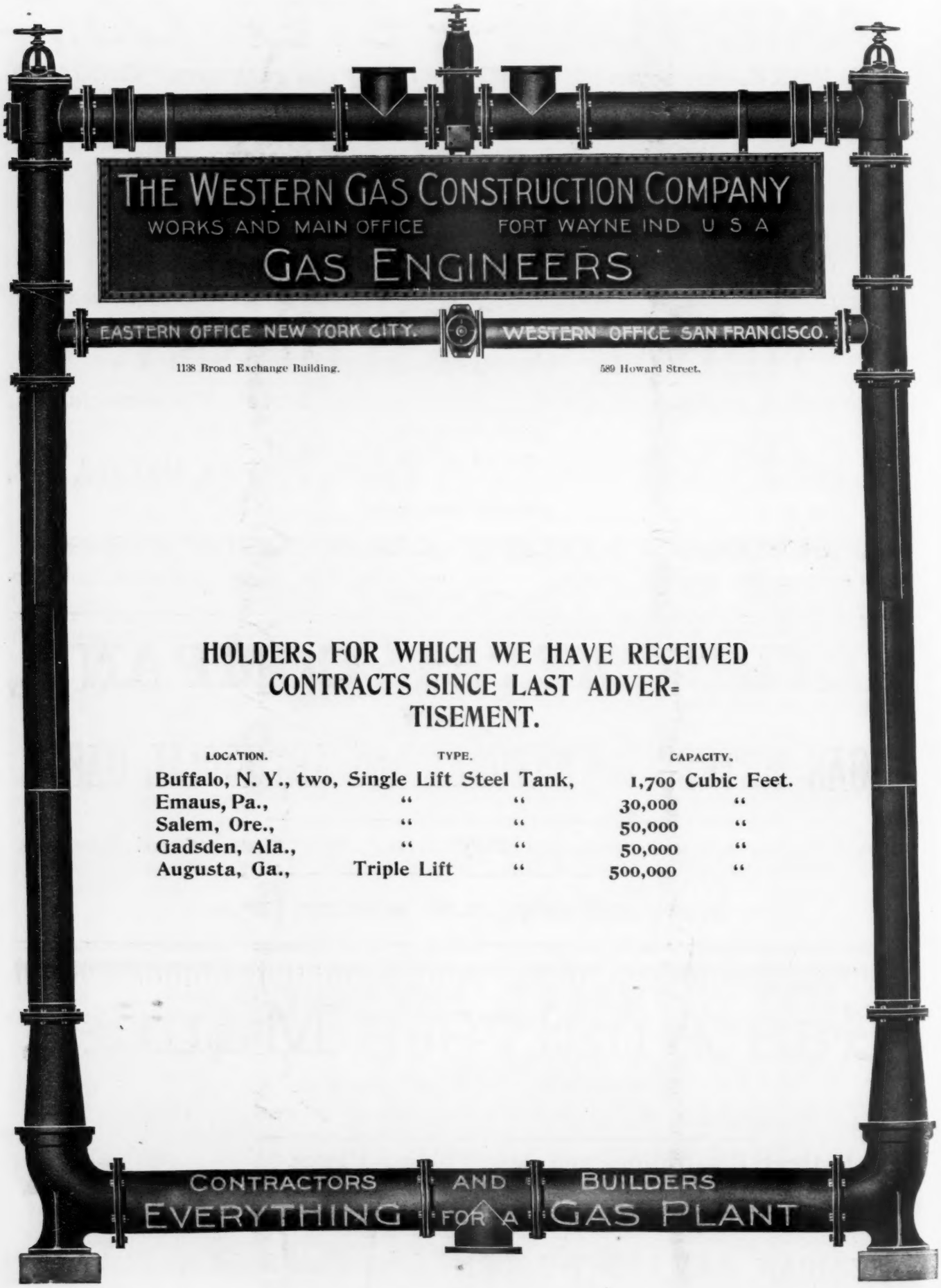
By JAQUES ABADY, M. Inst. Mech. E.

(Incorporating F. W. Hartley's "Gas Analyst's Manual" and "Gas Measurement.")

Ninety-three Illustrations and Nine Folding Plates.
Bound in Handsome Half Leather. Price, - **$6.50.**

FOR SALE BY

AMERICAN GAS LIGHT JOURNAL, 42 Pine St., New York City.


THE WESTERN GAS CONSTRUCTION COMPANY
WORKS AND MAIN OFFICE FORT WAYNE IND U S A
GAS ENGINEERS
EASTERN OFFICE NEW YORK CITY.
1138 Broad Exchange Building.
WESTERN OFFICE SAN FRANCISCO.
589 Howard Street.
CONTRACTORS AND BUILDERS
EVERYTHING FOR A GAS PLANT

HOLDERS FOR WHICH WE HAVE RECEIVED CONTRACTS SINCE LAST ADVERTISEMENT.

LOCATION.	TYPE.		CAPACITY.	
Buffalo, N. Y., two,	Single Lift	Steel Tank,	1,700	Cubic Feet.
Emaus, Pa.,	"	"	30,000	"
Salem, Ore.,	"	"	50,000	"
Gadsden, Ala.,	"	"	50,000	"
Augusta, Ga.,	Triple Lift	"	500,000	"